

Director

EUROPEAN COMMISSION Innovation and Networks Executive Agency



GRANT AGREEMENT

NUMBER — 731198 — Ruggedised

This Agreement ('the Agreement') is between the following parties:

on the one part,

the **Innovation and Networks Executive Agency (INEA)** ('the Agency'), under the power delegated by the European Commission ('the Commission')¹,

represented for the purposes of signature of this Agreement by Executive Director, Innovation and Networks Executive Agency, Dirk BECKERS,

and

on the other part,

1. 'the coordinator ':

GEMEENTE ROTTERDAM (ROT), N/A, established in COOLSINGEL 40, ROTTERDAM 3011 AD, Netherlands, VAT number NL001876387B07, represented for the purposes of signing the Agreement by Director, Paula VERHOEVEN

and the following other beneficiaries, if they sign their 'Accession Form' (see Annex 3 and Article 56):

2. UMEA KOMMUN (UME), 2120002627, established in SKOLGATAN 31A, UMEA 90184, Sweden, VAT number SE212000262701,

3. **GLASGOW CITY COUNCIL (GCC)**, established in 285 GEORGE STREET FINANCIAL SERVICES, GLASGOW G2 1DU, United Kingdom, VAT number GB653051560,

4. **SP SVERIGES TEKNISKA FORSKNINGSINSTITUT AB (SP)** AB, 5564646874, established in BRINELLGATAN 4, BORAS 501 15, Sweden, VAT number SE556464687401,

5. **ISTITUTO DI STUDI PER L'INTEGRAZIONE DEI SISTEMI SC (ISINNOVA)** SC, 344075/ CF00816470587, established in LARGO DEI LOMBARDI 4, ROMA 00186, Italy, VAT number IT00934601006,

6. **AIT AUSTRIAN INSTITUTE OF TECHNOLOGY GMBH (AIT)** GMBH, FN115980I, established in DONAU CITY STRASSE 1 TECH GATE VIENNA, WIEN 1220, Austria, VAT number ATU14703506,

7.NEDERLANDSEORGANISATIEVOORTOEGEPASTNATUURWETENSCHAPPELIJK ONDERZOEK TNO (TNO), 27376655, established in ANNAVAN BUERENPLEIN 1, DEN HAAG 2595 DA, Netherlands, VAT number NL002875718B01,

8. ICLEI EUROPEAN SECRETARIAT GMBH (ICLEI EUROPASEKRETARIAT GMBH)* (ICLEI) GMBH, HRB4188, established in Leopoldring 3, Freiburg 79098, Germany, VAT number DE153445986,

¹ Text in *italics* shows the options of the Model Grant Agreement that are applicable to this Agreement.

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9. **ERASMUS UNIVERSITEIT ROTTERDAM (EUR)**, 24495550, established in BURGEMEESTER OUDLAAN 50, ROTTERDAM 3062 PA, Netherlands, VAT number NL804735529B02,

10. **UMEA UNIVERSITET (UU)**, 2021002874, established in UNIVERSITETOMRADET, UMEA 901 87, Sweden, VAT number SE202100287401,

11. **UNIVERSITY OF STRATHCLYDE (US)**, RC000670, established in Richmond Street 16, GLASGOW G1 1XQ, United Kingdom, VAT number GB261339762,

12. **VYSOKE UCENI TECHNICKE V BRNE (UB)**, 00216305, established in ANTONINSKA 548/1, BRNO STRED 601 90, Czech Republic, VAT number CZ00216305,

13. **STATUTARNI MESTO BRNO (Brno)**, 44992785, established in DOMINIKANSKE NAMESTI 196/1, BRNO 602 00, Czech Republic, VAT number CZ44992785,

14. **COMUNE DI PARMA (Parma)**, CF00162210348, established in STRADA REPUBBLICA 1, PARMA 43121, Italy, VAT number IT00162210348,

15. URZAD MIEJSKI W GDANSKU (Gdansk), established in UL. NOWE OGRODY 8/12, GDANSK 80 803, Poland, VAT number PL5830011969,

16. **Ballast Nedam Bouw & Ontwikkeling Holding B.V. (BN)** BV, 30166075, established in Ringwade 71, Nieuwegein 3439 LM Nieuwegein, Netherlands, VAT number NL809065745B01,

17. **ROTTERDAMSE ELEKTRISCHE TRAM NV (RET)** NV, 24292838, established in LAAN OP ZUID 2, ROTTERDAM 3071 AA, Netherlands, VAT number NL808067655B01,

18. **ENECO ZAKELIJK BV (ENE)** BV, 24296168, established in MARTEN MEESWEG 5, ROTTERDAM 3068 AV, Netherlands, VAT number NL808464930B01,

19. Koninklijke KPN NV (KPN) NV, 02045200, established in MAANPLEIN 55, The Hague 2516 CK, Netherlands, VAT number NL009497006B01,

20. **AKADEMISKA HUS AKTIEBOLAG (AHAB)** AB, 5564599156, established in P O BOX 483, GOTEBORG 401 27, Sweden, VAT number SE556459915601,

21. **VASTERBOTTENS LANS LANDSTING (VCC)**, 2321000222, established in KOKSVAGEN 11, UMEA 90189, Sweden, VAT number SE232100022201,

22. UMEA ENERGI AKTIEBOLAG (UEAB) AB, 5560978602, established in ., UMEA 901 05, Sweden, VAT number SE556097860201,

23. UMEA PARKERINGS AKTIEBOLAG (UPAB) AB, 5561310573, established in PO BOX 297, UMEA 901 06, Sweden, VAT number SE556131057301,

24. **SCOTTISH GOVERNMENT (TS)**, N/A, established in St Andrews House, Regent Road, EDINBURGH EH1 3DG, United Kingdom, VAT number N/A,

25. **SP POWER SYSTEMS LIMITED (SPPS)** LTD, SC215841, established in ATLANTIC QUAY 1, GLASGOW G2 8SP, United Kingdom, VAT number GB659372008,

26. **TENNENT CALEDONIAN BREWERIES UK LIMITED (TCB)** LTD, SC362352, established in WELLPARK BREWERY 161 DUKE STREET, GLASGOW G31 1JD, United Kingdom, VAT number GB977375168,

27. **SIEMENS PUBLIC LIMITED COMPANY (SIE)**, 00727817, established in FARADAY HOUSE, SIR WILLIAM SIEMENS SQUARE, FRIMLEY, CAMBERLEY GU16 8QD, United Kingdom, VAT number GB479985260,

28. **PICTEC (PIC)** PL2, 360457960, established in UL. WIOSENNA 52, GDANSK 80178, Poland, VAT number PL5833173833,

29. UNIRESEARCH BV (UNR) BV, 27236872, established in Elektronicaweg 16c, DELFT 2628XG, Netherlands, VAT number NL810590372B01,

30. **INFOMOBILITY SPA (INF)** SPA, 218650, established in VIALE MENTANA 27, PARMA 43100, Italy, VAT number IT02199590346,

31. **FUTURE INSIGHT GROUP BV (FI)** BV, 63664836, established in HANZEPLEIN 11-27, ZWOLLE 8017 JD, Netherlands, VAT number NL855342468B01,

32. **THE GLASGOW HOUSING ASSOCIATION LIMITED IPS (WG)** GB25, SP2572RS, established in TRONGATE 177 GRANITE HOUSE, GLASGOW G1 5HF, United Kingdom, VAT number GB796709466,

33. **GDANSKA INFRASTRUCTURA WODOCIAGOWO-KANALIZACYJNA SP ZOO (GIWK)** SP(ZOO), 193079339, established in UL. KARTUSKA 201, GDANSK 80 122, Poland, VAT number PL5832870369,

34. ACREO SWEDISH ICT AB (SI) AB, 5565349007, established in BOX 1070, KISTA 164 25, Sweden, VAT number SE556534900701,

Unless otherwise specified, references to 'beneficiary' or 'beneficiaries' include the coordinator.

The parties referred to above have agreed to enter into the Agreement under the terms and conditions below.

By signing the Agreement or the Accession Form, the beneficiaries accept the grant and agree to implement it under their own responsibility and in accordance with the Agreement, with all the obligations and conditions it sets out.

The Agreement is composed of:

Terms and Conditions

Annex 1	Description of the action
Annex 2	Estimated budget for the action
Annex 3	Accession Forms
Annex 4	Model for the financial statements
Annex 5	Model for the certificate on the financial statements
Annex 6	Model for the certificate on the methodology

TERMS AND CONDITIONS

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CHAPTER 1 GENERAL

ARTICLE 1 — SUBJECT OF THE AGREEMENT

This Agreement sets out the rights and obligations and the terms and conditions applicable to the grant awarded to the beneficiaries for implementing the action set out in Chapter 2.

CHAPTER 2 ACTION

ARTICLE 2 — ACTION TO BE IMPLEMENTED

The grant is awarded for the action entitled '*Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment* — *Ruggedised*' ('action'), as described in Annex 1.

ARTICLE 3 — **DURATION AND STARTING DATE OF THE ACTION**

The duration of the action will be 60 months as of 1 November 2016 ('starting date of the action').

ARTICLE 4 — ESTIMATED BUDGET AND BUDGET TRANSFERS

4.1 Estimated budget

The 'estimated budget' for the action is set out in Annex 2.

It contains the estimated eligible costs and the forms of costs, broken down by beneficiary and budget category (see Articles 5, 6).

4.2 Budget transfers

The estimated budget breakdown indicated in Annex 2 may be adjusted by transfers of amounts between beneficiaries or between budget categories (or both). This does not require an amendment according to Article 55, if the action is implemented as described in Annex 1.

However, the beneficiaries may not add costs relating to subcontracts not provided for in Annex 1, unless such additional subcontracts are approved by an amendment or in accordance with Article 13.

CHAPTER 3 GRANT

ARTICLE 5 — GRANT AMOUNT, FORM OF GRANT, REIMBURSEMENT RATES AND FORMS OF COSTS

5.1 Maximum grant amount

The 'maximum grant amount' is EUR 17,692,858.41 (seventeen million six hundred and ninety two thousand eight hundred and fifty eight EURO and forty one eurocents).

5.2 Form of grant, reimbursement rates and forms of costs

The grant reimburses 100% of the eligible costs of the beneficiaries that are non-profit legal entities and 70% of the eligible costs of the beneficiaries that are profit legal entities (see Article 6) ('reimbursement of eligible costs grant') (see Annex 2).

The estimated eligible costs of the action are EUR **19,562,867.50** (nineteen million five hundred and sixty two thousand eight hundred and sixty seven EURO and fifty eurocents).

Eligible costs (see Article 6) must be declared under the following forms ('forms of costs'):

(a) for direct personnel costs:

- as actually incurred costs ('actual costs') or
- on the basis of an amount per unit calculated by the beneficiary in accordance with its usual cost accounting practices (**'unit costs'**).

Personnel **costs for SME owners** or **beneficiaries that are natural persons** not receiving a salary (see Article 6.2, Points A.4 and A.5) must be declared on the basis of the amount per unit set out in Annex 2 (**unit costs**);

- (b) for direct costs for subcontracting: as actually incurred costs (actual costs);
- (c) for direct costs of providing financial support to third parties: not applicable;
- (d) for other direct costs: as actually incurred costs (actual costs);
- (e) for **indirect costs**: on the basis of a flat-rate applied as set out in Article 6.2, Point E ('**flat-rate costs**');
- (f) *specific cost category(ies):* not applicable.

5.3 Final grant amount — Calculation

The 'final grant amount' depends on the actual extent to which the action is implemented in accordance with the Agreement's terms and conditions.

This amount is calculated by the *Agency* — when the payment of the balance is made (see Article 21.4) — in the following steps:

- Step 1 Application of the reimbursement rates to the eligible costs
- Step 2 Limit to the maximum grant amount
- Step 3 Reduction due to the no-profit rule
- Step 4 Reduction due to improper implementation or breach of other obligations

5.3.1 Step 1 — Application of the reimbursement rates to the eligible costs

The reimbursement rate(s) (see Article 5.2) are applied to the eligible costs (actual costs, unit costs and flat-rate costs; see Article 6) declared by the beneficiaries (see Article 20) and approved by the *Agency* (see Article 21).

5.3.2 Step 2 — Limit to the maximum grant amount

If the amount obtained following Step 1 is higher than the maximum grant amount set out in Article 5.1, it will be limited to the latter.

5.3.3 Step 3 — Reduction due to the no-profit rule

The grant must not produce a profit.

'Profit' means the surplus of the amount obtained following Steps 1 and 2 plus the action's total receipts, over the action's total eligible costs.

The 'action's total eligible costs' are the consolidated total eligible costs approved by the Agency.

The 'action's total receipts' are the consolidated total receipts generated during its duration (see Article 3).

The following are considered receipts:

- (a) income generated by the action; if the income is generated from selling equipment or other assets purchased under the Agreement, the receipt is up to the amount declared as eligible under the Agreement;
- (b) financial contributions given by third parties to the beneficiary specifically to be used for the action, and
- (c) in-kind contributions provided by third parties free of charge and specifically to be used for the action, if they have been declared as eligible costs.

The following are however not considered receipts:

- (a) income generated by exploiting the action's results (see Article 28);
- (b) financial contributions by third parties, if they may be used to cover costs other than the eligible costs (see Article 6);
- (c) financial contributions by third parties with no obligation to repay any amount unused at the end of the period set out in Article 3.

If there is a profit, it will be deducted from the amount obtained following Steps 1 and 2.

5.3.4 Step 4 — Reduction due to improper implementation or breach of other obligations — Reduced grant amount — Calculation

If the grant is reduced (see Article 43), the *Agency* will calculate the reduced grant amount by deducting the amount of the reduction (calculated in proportion to the improper implementation of

the action or to the seriousness of the breach of obligations in accordance with Article 43.2) from the maximum grant amount set out in Article 5.1.

The final grant amount will be the lower of the following two:

- the amount obtained following Steps 1 to 3 or
- the reduced grant amount following Step 4.

5.4 Revised final grant amount — Calculation

If — after the payment of the balance (in particular, after checks, reviews, audits or investigations; see Article 22) — the *Agency* rejects costs (see Article 42) or reduces the grant (see Article 43), it will calculate the '**revised final grant amount**' for the beneficiary concerned by the findings.

This amount is calculated by the *Agency* on the basis of the findings, as follows:

- in case of **rejection of costs**: by applying the reimbursement rate to the revised eligible costs approved by the *Agency* for the beneficiary concerned;
- in case of **reduction of the grant**: by calculating the concerned beneficiary's share in the grant amount reduced in proportion to its improper implementation of the action or to the seriousness of its breach of obligations (see Article 43.2).

In case of **rejection of costs and reduction of the grant**, the revised final grant amount for the beneficiary concerned will be the lower of the two amounts above.

ARTICLE 6 — ELIGIBLE AND INELIGIBLE COSTS

6.1 General conditions for costs to be eligible

'Eligible costs' are costs that meet the following criteria:

(a) for actual costs:

- (i) they must be actually incurred by the beneficiary;
- (ii) they must be incurred in the period set out in Article 3, with the exception of costs relating to the submission of the periodic report for the last reporting period and the final report (see Article 20);
- (iii) they must be indicated in the estimated budget set out in Annex 2;
- (iv) they must be incurred in connection with the action as described in Annex 1 and necessary for its implementation;
- (v) they must be identifiable and verifiable, in particular recorded in the beneficiary's accounts in accordance with the accounting standards applicable in the country where the beneficiary is established and with the beneficiary's usual cost accounting practices;
- (vi) they must comply with the applicable national law on taxes, labour and social security, and

(vii) they must be reasonable, justified and must comply with the principle of sound financial management, in particular regarding economy and efficiency;

(b) for **unit costs**:

(i) they must be calculated as follows:

{amounts per unit set out in Annex 2 or calculated by the beneficiary in accordance with its usual cost accounting practices (see Article 6.2, Point A)

multiplied by

the number of actual units};

- (ii) the number of actual units must comply with the following conditions:
 - the units must be actually used or produced in the period set out in Article 3;
 - the units must be necessary for implementing the action or produced by it, and
 - the number of units must be identifiable and verifiable, in particular supported by records and documentation (see Article 18);

(c) for flat-rate costs:

- (i) they must be calculated by applying the flat-rate set out in Annex 2, and
- (ii) the costs (actual costs or unit costs) to which the flat-rate is applied must comply with the conditions for eligibility set out in this Article.

6.2 Specific conditions for costs to be eligible

Costs are eligible if they comply with the general conditions (see above) and the specific conditions set out below for each of the following budget categories:

- A. direct personnel costs;
- B. direct costs of subcontracting;
- C. not applicable;
- D. other direct costs;
- E. indirect costs;
- F. not applicable.

'Direct costs' are costs that are directly linked to the action implementation and can therefore be attributed to it directly. They must not include any indirect costs (see Point E below).

'Indirect costs' are costs that are not directly linked to the action implementation and therefore cannot be attributed directly to it.

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A. Direct personnel costs

Types of eligible personnel costs

A.1 Personnel costs are eligible, if they are related to personnel working for the beneficiary under an employment contract (or equivalent appointing act) and assigned to the action ('costs for employees (or equivalent)'). They must be limited to salaries (including during parental leave), social security contributions, taxes and other costs included in the remuneration, if they arise from national law or the employment contract (or equivalent appointing act).

Beneficiaries that are non-profit legal entities² may also declare as personnel costs **additional remuneration** for personnel assigned to the action (including payments on the basis of supplementary contracts regardless of their nature), if:

- (a) it is part of the beneficiary's usual remuneration practices and is paid in a consistent manner whenever the same kind of work or expertise is required;
- (b) the criteria used to calculate the supplementary payments are objective and generally applied by the beneficiary, regardless of the source of funding used.

Additional remuneration for personnel assigned to the action is eligible up to the following amount:

- (a) if the person works full time and exclusively on the action during the full year: up to EUR 8 000;
- (b) if the person works exclusively on the action but not full-time or not for the full year: up to the corresponding pro-rata amount of EUR 8 000, or
- (c) if the person does not work exclusively on the action: up to a pro-rata amount calculated as follows:
 - {{EUR 8 000

divided by

the number of annual productive hours (see below)},

multiplied by

the number of hours that the person has worked on the action during the year}.

- A.2 The **costs for natural persons working under a direct contract** with the beneficiary other than an employment contract are eligible personnel costs, if:
 - (a) the person works under the beneficiary's instructions and, unless otherwise agreed with the beneficiary, on the beneficiary's premises;

² For the definition, see Article 2.1(14) of the Rules for Participation Regulation No 1290/2013: **'non-profit legal entity**' means a legal entity which by its legal form is non-profit-making or which has a legal or statutory obligation not to distribute profits to its shareholders or individual members.

- (b) the result of the work carried out belongs to the beneficiary, and
- (c) the costs are not significantly different from those for personnel performing similar tasks under an employment contract with the beneficiary.
- A.3 The costs of personnel seconded by a third party against payment are eligible personnel costs, if the conditions in Article 11.1 are met.
- A.4 **Costs of owners** of beneficiaries that are small and medium-sized enterprises ('**SME owners**') who are working on the action and who do not receive a salary are eligible personnel costs, if they correspond to the amount per unit set out in Annex 2 multiplied by the number of actual hours worked on the action.
- A.5 Costs of 'beneficiaries that are natural persons' not receiving a salary are eligible personnel costs, if they correspond to the amount per unit set out in Annex 2 multiplied by the number of actual hours worked on the action.

Calculation

Personnel costs must be calculated by the beneficiaries as follows:

{{hourly rate

multiplied by

the number of actual hours worked on the action},

plus

for non-profit legal entities: additional remuneration to personnel assigned to the action under the conditions set out above (Point A.1)}.

The number of actual hours declared for a person must be identifiable and verifiable (see Article 18).

The total number of hours declared in EU or Euratom grants, for a person for a year, cannot be higher than the annual productive hours used for the calculations of the hourly rate. Therefore, the maximum number of hours that can be declared for the grant is:

{the number of annual productive hours for the year (see below)

minus

total number of hours declared by the beneficiary for that person in that year for other EU or Euratom grants}.

The 'hourly rate' is one of the following:

(a) for personnel costs declared as **actual costs:** the hourly rate is the amount calculated as follows:

{actual annual personnel costs (excluding additional remuneration) for the person

divided by

number of annual productive hours}.

The beneficiaries must use the annual personnel costs and the number of annual productive hours for each financial year covered by the reporting period. If a financial year is not closed at the end of the reporting period, the beneficiaries must use the hourly rate of the last closed financial year available.

For the 'number of annual productive hours', the beneficiaries may choose one of the following:

- (i) 'fixed number of hours': 1 720 hours for persons working full time (or corresponding prorata for persons not working full time);
- (ii) 'individual annual productive hours': the total number of hours worked by the person in the year for the beneficiary, calculated as follows:

{annual workable hours of the person (according to the employment contract, applicable collective labour agreement or national law)

plus

overtime worked

minus

absences (such as sick leave and special leave)}.

'Annual workable hours' means the period during which the personnel must be working, at the employer's disposal and carrying out his/her activity or duties under the employment contract, applicable collective labour agreement or national working time legislation.

If the contract (or applicable collective labour agreement or national working time legislation) does not allow to determine the annual workable hours, this option cannot be used;

(iii) 'standard annual productive hours': the 'standard number of annual hours' generally applied by the beneficiary for its personnel in accordance with its usual cost accounting practices. This number must be at least 90% of the 'standard annual workable hours'.

If there is no applicable reference for the standard annual workable hours, this option cannot be used.

For all options, the actual time spent on **parental leave** by a person assigned to the action may be deducted from the number of annual productive hours;

(b) for personnel costs declared on the basis of **unit costs**: the hourly rate is one of the following:

- (i) for SME owners or beneficiaries that are natural persons: the hourly rate set out in Annex 2 (see Points A.4 and A.5 above), or
- (ii) for personnel costs declared on the basis of the beneficiary's usual cost accounting practices: the hourly rate calculated by the beneficiary in accordance with its usual cost accounting practices, if:

- the cost accounting practices used are applied in a consistent manner, based on objective criteria, regardless of the source of funding;
- the hourly rate is calculated using the actual personnel costs recorded in the beneficiary's accounts, excluding any ineligible cost or costs included in other budget categories.

The actual personnel costs may be adjusted by the beneficiary on the basis of budgeted or estimated elements. Those elements must be relevant for calculating the personnel costs, reasonable and correspond to objective and verifiable information;

and

- the hourly rate is calculated using the number of annual productive hours (see above).

B. Direct costs of subcontracting (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible if the conditions in Article 13.1.1 are met.

C. Direct costs of providing financial support to third parties not applicable.

D. Other direct costs

- D.1 **Travel costs and related subsistence allowances** (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible if they are in line with the beneficiary's usual practices on travel.
- D.2 The depreciation costs of equipment, infrastructure or other assets (new or second-hand) as recorded in the beneficiary's accounts are eligible, if they were purchased in accordance with Article 10.1.1 and written off in accordance with international accounting standards and the beneficiary's usual accounting practices.

The costs of renting or leasing equipment, infrastructure or other assets (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are also eligible, if they do not exceed the depreciation costs of similar equipment, infrastructure or assets and do not include any financing fees.

The costs of equipment, infrastructure or other assets **contributed in-kind against payment** are eligible, if they do not exceed the depreciation costs of similar equipment, infrastructure or assets, do not include any financing fees and if the conditions in Article 11.1 are met.

The only portion of the costs that will be taken into account is that which corresponds to the duration of the action and rate of actual use for the purposes of the action.

- D.3 **Costs of other goods and services** (including related duties, taxes and charges such as nondeductible value added tax (VAT) paid by the beneficiary) are eligible, if they are:
 - (a) purchased specifically for the action and in accordance with Article 10.1.1 or

(b) contributed in kind against payment and in accordance with Article 11.1.

Such goods and services include, for instance, consumables and supplies, dissemination (including open access), protection of results, certificates on the financial statements (if they are required by the Agreement), certificates on the methodology, translations and publications.

- D.4 Capitalised and operating costs of 'large research infrastructure'³ directly used for the action are eligible, if:
 - (a) the value of the large research infrastructure represents at least 75% of the total fixed assets (at historical value in its last closed balance sheet before the date of the signature of the Agreement or as determined on the basis of the rental and leasing costs of the research infrastructure⁴);
 - (b) the beneficiary's methodology for declaring the costs for large research infrastructure has been positively assessed by the Commission ('ex-ante assessment');
 - (c) the beneficiary declares as direct eligible costs only the portion which corresponds to the duration of the action and the rate of actual use for the purposes of the action, and
 - *(d) they comply with the conditions as further detailed in the annotations to the H2020 grant agreements.*

E. Indirect costs

Indirect costs are eligible if they are declared on the basis of the flat-rate of 25% of the eligible direct costs (see Article 5.2 and Points A to D above), from which are excluded:

- (a) costs of subcontracting and
- (b) costs of in-kind contributions provided by third parties which are not used on the beneficiary's premises;
- (c) not applicable;
- (d) not applicable.

³ **'Large research infrastructure'** means research infrastructure of a total value of at least EUR 20 million, for a beneficiary, calculated as the sum of historical asset values of each individual research infrastructure of that beneficiary, as they appear in its last closed balance sheet before the date of the signature of the Agreement or as determined on the basis of the rental and leasing costs of the research infrastructure.

⁴ For the definition, see Article 2(6) of Regulation (EU) No 1291/2013 of the European Parliament and of the Council of 11 December 2013 establishing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020) (OJ L 347, 20.12.2013 p.104)-('Horizon 2020 Framework Programme Regulation No 1291/2013'): 'Research infrastructure' are facilities, resources and services that are used by the research communities to conduct research and foster innovation in their fields. Where relevant, they may be used beyond research, e.g. for education or public services. They include: major scientific equipment (or sets of instruments); knowledge-based resources such as collections, archives or scientific data; e-infrastructures such as data and computing systems and communication networks; and any other infrastructure of a unique nature essential to achieve excellence in research and innovation. Such infrastructures may be 'single-sited', 'virtual' or 'distributed'.

Beneficiaries receiving an operating grant⁵ financed by the EU or Euratom budget cannot declare indirect costs for the period covered by the operating grant.

F. Specific cost category(ies)

Not applicable

6.3 Conditions for costs of linked third parties to be eligible

not applicable

6.4 Conditions for in-kind contributions provided by third parties free of charge to be eligible

In-kind contributions provided free of charge are eligible direct costs (for the beneficiary), if the costs incurred by the third party fulfil — *mutatis mutandis* — the general and specific conditions for eligibility set out in this Article (Article 6.1 and 6.2) and Article 12.1.

6.5 Ineligible costs

'Ineligible costs' are:

- (a) costs that do not comply with the conditions set out above (Article 6.1 to 6.4), in particular:
 - (i) costs related to return on capital;
 - (ii) debt and debt service charges;
 - (iii) provisions for future losses or debts;
 - (iv) interest owed;
 - (v) doubtful debts;
 - (vi) currency exchange losses;
 - (vii) bank costs charged by the beneficiary's bank for transfers from the Agency;
 - (viii) excessive or reckless expenditure;
 - (ix) deductible VAT;
 - (x) costs incurred during suspension of the implementation of the action (see Article 49);
- (b) costs declared under another EU or Euratom grant (including grants awarded by a Member State and financed by the EU or Euratom budget and grants awarded by bodies other than the

⁵ For the definition, see Article 121(1)(b) of Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002 (OJ L 218, 26.10.2012, p.1) ('**Financial Regulation No 966/2012**'): '**operating grant**' means direct financial contribution, by way of donation, from the budget in order to finance the functioning of a body which pursues an aim of general EU interest or has an objective forming part of and supporting an EU policy.

Agency for the purpose of implementing the EU or Euratom budget); in particular, indirect costs if the beneficiary is already receiving an operating grant financed by the EU or Euratom budget in the same period.

6.6 Consequences of declaration of ineligible costs

Declared costs that are ineligible will be rejected (see Article 42).

This may also lead to any of the other measures described in Chapter 6.

CHAPTER 4 RIGHTS AND OBLIGATIONS OF THE PARTIES

SECTION 1 RIGHTS AND OBLIGATIONS RELATED TO IMPLEMENTING THE ACTION

ARTICLE 7 — GENERAL OBLIGATION TO PROPERLY IMPLEMENT THE ACTION

7.1 General obligation to properly implement the action

The beneficiaries must implement the action as described in Annex 1 and in compliance with the provisions of the Agreement and all legal obligations under applicable EU, international and national law.

7.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 8 — RESOURCES TO IMPLEMENT THE ACTION — THIRD PARTIES INVOLVED IN THE ACTION

The beneficiaries must have the appropriate resources to implement the action.

If it is necessary to implement the action, the beneficiaries may:

- purchase goods, works and services (see Article 10);
- use in-kind contributions provided by third parties against payment (see Article 11);
- use in-kind contributions provided by third parties free of charge (see Article 12);
- call upon subcontractors to implement action tasks described in Annex 1 (see Article 13);
- call upon linked third parties to implement action tasks described in Annex 1 (see Article 14).

In these cases, the beneficiaries retain sole responsibility towards the *Agency* and the other beneficiaries for implementing the action.

ARTICLE 9 — IMPLEMENTATION OF ACTION TASKS BY BENEFICIARIES NOT RECEIVING EU FUNDING

Not applicable

ARTICLE 10 — PURCHASE OF GOODS, WORKS OR SERVICES

10.1 Rules for purchasing goods, works or services

10.1.1 If necessary to implement the action, the beneficiaries may purchase goods, works or services.

The beneficiaries must make such purchases ensuring the best value for money or, if appropriate, the lowest price. In doing so, they must avoid any conflict of interests (see Article 35).

The beneficiaries must ensure that *the Agency*, the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards their contractors.

10.1.2 Beneficiaries that are 'contracting authorities' within the meaning of Directive $2004/18/\text{EC}^6$ or 'contracting entities' within the meaning of Directive $2004/17/\text{EC}^7$ must comply with the applicable national law on public procurement.

10.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Article 10.1.1, the costs related to the contract concerned will be ineligible (see Article 6) and will be rejected (see Article 42).

If a beneficiary breaches any of its obligations under Article 10.1.2, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 11 — USE OF IN-KIND CONTRIBUTIONS PROVIDED BY THIRD PARTIES AGAINST PAYMENT

11.1 Rules for the use of in-kind contributions against payment

If necessary to implement the action, the beneficiaries may use in-kind contributions provided by third parties against payment.

The beneficiaries may declare costs related to the payment of in-kind contributions as eligible (see Article 6.1 and 6.2), up to the third parties' costs for the seconded persons, contributed equipment, infrastructure or other assets or other contributed goods and services.

The third parties and their contributions must be set out in Annex 1. The *Agency* may however approve in-kind contributions not set out in Annex 1 without amendment (see Article 55), if:

⁶ Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public work contracts, public supply contracts and public service contracts (OJ L 134, 30.04.2004, p. 114).

⁷ Directive 2004/17/EC of the European Parliament and of the Council of 31 March 2004 coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors (OJ L 134, 30.04.2004, p. 1).

- they are specifically justified in the periodic technical report and
- their use does not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiaries must ensure that *the Agency*, the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards the third parties.

11.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the costs related to the payment of the in-kind contribution will be ineligible (see Article 6) and will be rejected (see Article 42).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 12 — USE OF IN-KIND CONTRIBUTIONS PROVIDED BY THIRD PARTIES FREE OF CHARGE

12.1 Rules for the use of in-kind contributions free of charge

If necessary to implement the action, the beneficiaries may use in-kind contributions provided by third parties free of charge.

The beneficiaries may declare costs incurred by the third parties for the seconded persons, contributed equipment, infrastructure or other assets or other contributed goods and services as eligible in accordance with Article 6.4.

The third parties and their contributions must be set out in Annex 1. The *Agency* may however approve in-kind contributions not set out in Annex 1 without amendment (see Article 55), if:

- they are specifically justified in the periodic technical report and
- their use does not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiaries must ensure that *the Agency*, the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards the third parties.

12.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the costs incurred by the third parties related to the in-kind contribution will be ineligible (see Article 6) and will be rejected (see Article 42).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 13 — IMPLEMENTATION OF ACTION TASKS BY SUBCONTRACTORS

13.1 Rules for subcontracting action tasks

13.1.1 If necessary to implement the action, the beneficiaries may award subcontracts covering the implementation of certain action tasks described in Annex 1.

Subcontracting may cover only a limited part of the action.

The beneficiaries must award the subcontracts ensuring the best value for money or, if appropriate, the lowest price. In doing so, they must avoid any conflict of interests (see Article 35).

The tasks to be implemented and the estimated cost for each subcontract must be set out in Annex 1 and the total estimated costs of subcontracting per beneficiary must be set out in Annex 2. The *Agency* may however approve subcontracts not set out in Annex 1 and 2 without amendment (see Article 55), if:

- they are specifically justified in the periodic technical report and
- they do not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiaries must ensure that *the Agency*, the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards their subcontractors.

13.1.2 The beneficiaries must ensure that their obligations under Articles 35, 36, 38 and 46 also apply to the subcontractors.

Beneficiaries that are 'contracting authorities' within the meaning of Directive 2004/18/EC or 'contracting entities' within the meaning of Directive 2004/17/EC must comply with the applicable national law on public procurement.

13.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Article 13.1.1, the costs related to the subcontract concerned will be ineligible (see Article 6) and will be rejected (see Article 42).

If a beneficiary breaches any of its obligations under Article 13.1.2, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 14 — IMPLEMENTATION OF ACTION TASKS BY LINKED THIRD PARTIES

Not applicable

ARTICLE 15 — FINANCIAL SUPPORT TO THIRD PARTIES

15.1 Rules for providing financial support to third parties

Not applicable

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15.2 Financial support in the form of prizes

Not applicable

15.3 Consequences of non-compliance

Not applicable

ARTICLE 16 — PROVISION OF TRANS-NATIONAL OR VIRTUAL ACCESS TO RESEARCH INFRASTRUCTURE

16.1 Rules for providing trans-national access to research infrastructure

Not applicable

16.2 Rules for providing virtual access to research infrastructure

Not applicable

16.3 Consequences of non-compliance

Not applicable

SECTION 2 RIGHTS AND OBLIGATIONS RELATED TO THE GRANT ADMINISTRATION

ARTICLE 17 — GENERAL OBLIGATION TO INFORM

17.1 General obligation to provide information upon request

The beneficiaries must provide — during implementation of the action or afterwards and in accordance with Article 41.2 — any information requested in order to verify eligibility of the costs, proper implementation of the action and compliance with any other obligation under the Agreement.

17.2 Obligation to keep information up to date and to inform about events and circumstances likely to affect the Agreement

Each beneficiary must keep information stored in the 'Beneficiary Register' (via the electronic exchange system; see Article 52) up to date, in particular, its name, address, legal representatives, legal form and organisation type.

Each beneficiary must immediately inform the coordinator — which must immediately inform the *Agency* and the other beneficiaries — of any of the following:

- (a) **events** which are likely to affect significantly or delay the implementation of the action or the EU's financial interests, in particular:
 - (i) changes in its legal, financial, technical, organisational or ownership situation

(b) circumstances affecting:

(i) the decision to award the grant or

(ii) compliance with requirements under the Agreement.

17.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 18 — KEEPING RECORDS — SUPPORTING DOCUMENTATION

18.1 Obligation to keep records and other supporting documentation

The beneficiaries must — for a period of *five* years after the payment of the balance — keep records and other supporting documentation in order to prove the proper implementation of the action and the costs they declare as eligible.

They must make them available upon request (see Article 17) or in the context of checks, reviews, audits or investigations (see Article 22).

If there are on-going checks, reviews, audits, investigations, litigation or other pursuits of claims under the Agreement (including the extension of findings; see Articles 22), the beneficiaries must keep the records and other supporting documentation until the end of these procedures.

The beneficiaries must keep the original documents. Digital and digitalised documents are considered originals if they are authorised by the applicable national law. The *Agency* may accept non-original documents if it considers that they offer a comparable level of assurance.

18.1.1 Records and other supporting documentation on the scientific and technical implementation

The beneficiaries must keep records and other supporting documentation on scientific and technical implementation of the action in line with the accepted standards in the respective field.

18.1.2 Records and other documentation to support the costs declared

The beneficiaries must keep the records and documentation supporting the costs declared, in particular the following:

- (a) for actual costs: adequate records and other supporting documentation to prove the costs declared, such as contracts, subcontracts, invoices and accounting records. In addition, the beneficiaries' usual cost accounting practices and internal control procedures must enable direct reconciliation between the amounts declared, the amounts recorded in their accounts and the amounts stated in the supporting documentation;
- (b) for **unit costs**: adequate records and other supporting documentation to prove the number of units declared. Beneficiaries do not need to identify the actual eligible costs covered or to keep or provide supporting documentation (such as accounting statements) to prove the amount per unit.

In addition, for direct personnel costs declared as unit costs calculated in accordance with the beneficiary's usual cost accounting practices, the beneficiaries must keep adequate records and documentation to prove that the cost accounting practices used comply with the conditions set out in Article 6.2, Point A.

The beneficiaries may submit to the Commission, for approval, a certificate (drawn up in accordance with Annex 6) stating that their usual cost accounting practices comply with these conditions (**'certificate on the methodology**'). If the certificate is approved, costs declared in line with this methodology will not be challenged subsequently, unless the beneficiaries have concealed information for the purpose of the approval.

(c) for **flat-rate costs**: adequate records and other supporting documentation to prove the eligibility of the costs to which the flat-rate is applied. The beneficiaries do not need to identify the costs covered or provide supporting documentation (such as accounting statements) to prove the amount declared at a flat-rate.

In addition, for **personnel costs** (declared as actual costs or on the basis of unit costs), the beneficiaries must keep **time records** for the number of hours declared. The time records must be in writing and approved by the persons working on the action and their supervisors, at least monthly. In the absence of reliable time records of the hours worked on the action, the *Agency* may accept alternative evidence supporting the number of hours declared, if it considers that it offers an adequate level of assurance.

As an exception, for **persons working exclusively on the action**, there is no need to keep time records, if the beneficiary signs a **declaration** confirming that the persons concerned have worked exclusively on the action.

18.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, costs insufficiently substantiated will be ineligible (see Article 6) and will be rejected (see Article 42), and the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 19 — SUBMISSION OF DELIVERABLES

19.1 Obligation to submit deliverables

The coordinator must submit the '**deliverables**' identified in Annex 1, in accordance with the timing and conditions set out in it.

19.2 Consequences of non-compliance

If the coordinator breaches any of its obligations under this Article, the *Agency* may apply any of the measures described in Chapter 6.

ARTICLE 20 — REPORTING — PAYMENT REQUESTS

20.1 Obligation to submit reports

The coordinator must submit to the *Agency* (see Article 52) the technical and financial reports set out in this Article. These reports include requests for payment and must be drawn up using the forms and templates provided in the electronic exchange system (see Article 52).

20.2 Reporting periods

The action is divided into the following 'reporting periods':

- RP1: from month 1 to month 18
- RP2: from month 19 to month 30
- RP3: from month 31 to month 42
- RP4: from month 43 to month 60

20.3 Periodic reports — Requests for interim payments

The coordinator must submit a periodic report within 60 days following the end of each reporting period.

The **periodic report** must include the following:

- (a) a 'periodic technical report' containing:
 - (i) an **explanation of the work carried out** by the beneficiaries;
 - (ii) an **overview of the progress** towards the objectives of the action, including milestones and deliverables identified in Annex 1.

This report must include explanations justifying the differences between work expected to be carried out in accordance with Annex 1 and that actually carried out.

The report must also detail the exploitation and dissemination of the results and — if required in Annex 1 — an updated '**plan for the exploitation and dissemination of the results**';

- (iii) a **summary** for publication by the *Agency*;
- (iv) the answers to the '**questionnaire**', covering issues related to the action implementation and the economic and societal impact, notably in the context of the Horizon 2020 key performance indicators and the Horizon 2020 monitoring requirements;

(b) a 'periodic financial report' containing:

(i) an '**individual financial statement**' (see Annex 4) from each beneficiary, for the reporting period concerned.

The individual financial statement must detail the eligible costs (actual costs, unit costs and flat-rate costs; see Article 6) for each budget category (see Annex 2).

The beneficiaries must declare all eligible costs, even if — for actual costs, unit costs and flat-rate costs — they exceed the amounts indicated in the estimated budget (see Annex 2). Amounts which are not declared in the individual financial statement will not be taken into account by the *Agency*.

If an individual financial statement is not submitted for a reporting period, it may be included in the periodic financial report for the next reporting period.

The individual financial statements of the last reporting period must also detail the **receipts of the action** (see Article 5.3.3).

Each beneficiary must **certify** that:

- the information provided is full, reliable and true;
- the costs declared are eligible (see Article 6);
- the costs can be substantiated by adequate records and supporting documentation (see Article 18) that will be produced upon request (see Article 17) or in the context of checks, reviews, audits and investigations (see Article 22), and
- for the last reporting period: that all the receipts have been declared (see Article 5.3.3);
- (ii) an **explanation of the use of resources** and the information on subcontracting (see Article 13) and in-kind contributions provided by third parties (see Articles 11 and 12) from each beneficiary, for the reporting period concerned;
- (iii) not applicable;
- (iv) a '**periodic summary financial statement**' (see Annex 4), created automatically by the electronic exchange system, consolidating the individual financial statements for the reporting period concerned and including except for the last reporting period the **request for interim payment**.

20.4 Final report — Request for payment of the balance

In addition to the periodic report for the last reporting period, the coordinator must submit the final report within 60 days following the end of the last reporting period.

The **final report** must include the following:

- (a) a 'final technical report' with a summary for publication containing:
 - (i) an overview of the results and their exploitation and dissemination;
 - (ii) the conclusions on the action, and
 - (iii) the socio-economic impact of the action;

(b) a 'final financial report' containing:

- (i) a 'final summary financial statement' (see Annex 4), created automatically by the electronic exchange system, consolidating the individual financial statements for all reporting periods and including the request for payment of the balance and
- (ii) a '**certificate on the financial statements**' (drawn up in accordance with Annex 5) for each beneficiary, if it requests a total contribution of EUR 325 000 or more, as reimbursement of actual costs and unit costs calculated on the basis of its usual cost accounting practices (see Article 5.2 and Article 6.2, Point A).

20.5 Information on cumulative expenditure incurred

Not applicable

20.6 Currency for financial statements and conversion into euro

Financial statements must be drafted in euro.

Beneficiaries with accounting established in a currency other than the euro must convert the costs recorded in their accounts into euro, at the average of the daily exchange rates published in the C series of the *Official Journal of the European Union*, calculated over the corresponding reporting period.

If no daily euro exchange rate is published in the *Official Journal of the European Union* for the currency in question, they must be converted at the average of the monthly accounting rates published on the Commission's website, calculated over the corresponding reporting period.

Beneficiaries with accounting established in euro must convert costs incurred in another currency into euro according to their usual accounting practices.

20.7 Language of reports

All reports (technical and financial reports, including financial statements) must be submitted in the language of the Agreement.

20.8 Consequences of non-compliance — Suspension of the payment deadline — Termination

If the reports submitted do not comply with this Article, the *Agency* may suspend the payment deadline (see Article 47) and apply any of the other measures described in Chapter 6.

If the coordinator breaches its obligation to submit the reports and if it fails to comply with this obligation within 30 days following a written reminder sent by the *Agency*, the Agreement may be terminated (see Article 50).

ARTICLE 21 — PAYMENTS AND PAYMENT ARRANGEMENTS

21.1 Payments to be made

The following payments will be made to the coordinator:

- one pre-financing payment;

- one or more **interim payments**, on the basis of the request(s) for interim payment (see Article 20), and
- one **payment of the balance**, on the basis of the request for payment of the balance (see Article 20).

21.2 Pre-financing payment — Amount — Amount retained for the Guarantee Fund

The aim of the pre-financing is to provide the beneficiaries with a float.

It remains the property of the EU until the payment of the balance.

The amount of the pre-financing payment will be EUR **7,077,143.36** (seven million seventy seven thousand one hundred and forty three EURO and thirty six eurocents).

The *Agency* will — except if Article 48 applies — make the pre-financing payment to the coordinator within 30 days either from the entry into force of the Agreement (see Article 58) or from 10 days before the starting date of the action (see Article 3), whichever is the latest.

An amount of EUR **884,642.92** (eight hundred and eighty four thousand six hundred and forty two EURO and ninety two eurocents), corresponding to 5% of the maximum grant amount (see Article 5.1), is retained by the *Agency* from the pre-financing payment and transferred into the 'Guarantee Fund'.

21.3 Interim payments — Amount — Calculation

Interim payments reimburse the eligible costs incurred for the implementation of the action during the corresponding reporting periods.

The *Agency* will pay to the coordinator the amount due as interim payment within 90 days from receiving the periodic report (see Article 20.3), except if Articles 47 or 48 apply.

Payment is subject to the approval of the periodic report. Its approval does not imply recognition of the compliance, authenticity, completeness or correctness of its content.

The **amount due as interim payment** is calculated by the *Agency* in the following steps:

Step 1 – Application of the reimbursement rates

Step 2 – Limit to 90% of the maximum grant amount

21.3.1 Step 1 — Application of the reimbursement rates

The reimbursement rate(s) (see Article 5.2) are applied to the eligible costs (actual costs, unit costs and flat-rate costs; see Article 6) declared by the beneficiaries (see Article 20) and approved by the *Agency* (see above) for the concerned reporting period.

21.3.2 Step 2 — Limit to 90% of the maximum grant amount

The total amount of pre-financing and interim payments must not exceed 90% of the maximum grant amount set out in Article 5.1. The maximum amount for the interim payment will be calculated as follows:

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{90% of the maximum grant amount (see Article 5.1)

minus

{pre-financing and previous interim payments}}.

21.4 Payment of the balance — Amount — Calculation — Release of the amount retained for the Guarantee Fund

The payment of the balance reimburses the remaining part of the eligible costs incurred by the beneficiaries for the implementation of the action.

If the total amount of earlier payments is greater than the final grant amount (see Article 5.3), the payment of the balance takes the form of a recovery (see Article 44).

If the total amount of earlier payments is lower than the final grant amount, the *Agency* will pay the balance within 90 days from receiving the final report (see Article 20.4), except if Articles 47 or 48 apply.

Payment is subject to the approval of the final report. Its approval does not imply recognition of the compliance, authenticity, completeness or correctness of its content.

The **amount due as the balance** is calculated by the *Agency* by deducting the total amount of prefinancing and interim payments (if any) already made, from the final grant amount determined in accordance with Article 5.3:

{final grant amount (see Article 5.3)

minus

{pre-financing and interim payments (if any) made}}.

At the payment of the balance, the amount retained for the Guarantee Fund (see above) will be released and:

- if the balance is positive: the amount released will be paid in full to the coordinator together with the amount due as the balance;
- if the balance is negative (payment of the balance taking the form of recovery): it will be deducted from the amount released (see Article 44.1.2). If the resulting amount:
 - is positive, it will be paid to the coordinator
 - is negative, it will be recovered.

The amount to be paid may however be offset — without the beneficiary's consent — against any other amount owed by the beneficiary to the *Agency, the* Commission or an*other* executive agency (under the EU or Euratom budget), up to the maximum EU contribution indicated, for that beneficiary, in the estimated budget (see Annex 2).

21.5 Notification of amounts due

When making payments, the *Agency* will formally notify to the coordinator the amount due, specifying whether it concerns an interim payment or the payment of the balance.

For the payment of the balance, the notification will also specify the final grant amount.

In the case of reduction of the grant or recovery of undue amounts, the notification will be preceded by the contradictory procedure set out in Articles 43 and 44.

21.6 Currency for payments

The Agency will make all payments in euro.

21.7 Payments to the coordinator — Distribution to the beneficiaries

Payments will be made to the coordinator.

Payments to the coordinator will discharge the Agency from its payment obligation.

The coordinator must distribute the payments between the beneficiaries without unjustified delay.

Pre-financing may however be distributed only:

- (a) if the minimum number of beneficiaries set out in the call for proposals has acceded to the Agreement (see Article 56) and
- (b) to beneficiaries that have acceded to the Agreement (see Article 56).

21.8 Bank account for payments

All payments will be made to the following bank account:

Name of bank: ABN AMRO BANK N.V. Address of branch: GUSTAV MAHLERLAAN 10 AMSTERDAM, Netherlands Full name of the account holder: GEM RSO INKOMENDE SUBSIDIES Full account number (including bank codes): IBAN code: NL88ABNA0601110595

21.9 Costs of payment transfers

The cost of the payment transfers is borne as follows:

- the *Agency* bears the cost of transfers charged by its bank;
- the beneficiary bears the cost of transfers charged by its bank;
- the party causing a repetition of a transfer bears all costs of the repeated transfer.

21.10 Date of payment

Payments by the *Agency* are considered to have been carried out on the date when they are debited to its account.

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21.11 Consequences of non-compliance

21.11.1 If the *Agency* does not pay within the payment deadlines (see above), the beneficiaries are entitled to **late-payment interest** at the rate applied by the European Central Bank (ECB) for its main refinancing operations in euros ('reference rate'), plus three and a half points. The reference rate is the rate in force on the first day of the month in which the payment deadline expires, as published in the C series of the *Official Journal of the European Union*.

If the late-payment interest is lower than or equal to EUR 200, it will be paid to the coordinator only upon request submitted within two months of receiving the late payment.

Late-payment interest is not due if all beneficiaries are EU Member States (including regional and local government authorities or other public bodies acting on behalf of a Member State for the purpose of this Agreement).

Suspension of the payment deadline or payments (see Articles 47 and 48) will not be considered as late payment.

Late-payment interest covers the period running from the day following the due date for payment (see above), up to and including the date of payment.

Late-payment interest is not considered for the purposes of calculating the final grant amount.

21.11.2 If the coordinator breaches any of its obligations under this Article, the grant may be reduced (see Article 43) and the Agreement or the participation of the coordinator may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 22 — CHECKS, REVIEWS, AUDITS AND INVESTIGATIONS — EXTENSION OF FINDINGS

22.1 Checks, reviews and audits by the Agency and the Commission

22.1.1 Right to carry out checks

The *Agency or the* Commission will — during the implementation of the action or afterwards — check the proper implementation of the action and compliance with the obligations under the Agreement, including assessing deliverables and reports.

For this purpose the Agency or the Commission may be assisted by external persons or bodies.

The *Agency or the* Commission may also request additional information in accordance with Article 17. The *Agency or the* Commission may request beneficiaries to provide such information to it directly.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

22.1.2 Right to carry out reviews

The *Agency or the* Commission may — during the implementation of the action or afterwards — carry out reviews on the proper implementation of the action (including assessment of deliverables
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and reports), compliance with the obligations under the Agreement and continued scientific or technological relevance of the action.

Reviews may be started **up to two years after the payment of the balance**. They will be formally notified to the coordinator or beneficiary concerned and will be considered to have started on the date of the formal notification.

If the review is carried out on a third party (see Articles 10 to 16), the beneficiary concerned must inform the third party.

The *Agency or the* Commission may carry out reviews directly (using its own staff) or indirectly (using external persons or bodies appointed to do so). It will inform the coordinator or beneficiary concerned of the identity of the external persons or bodies. They have the right to object to the appointment on grounds of commercial confidentiality.

The coordinator or beneficiary concerned must provide — within the deadline requested — any information and data in addition to deliverables and reports already submitted (including information on the use of resources). The *Agency or the* Commission may request beneficiaries to provide such information to it directly.

The coordinator or beneficiary concerned may be requested to participate in meetings, including with external experts.

For **on-the-spot** reviews, the beneficiaries must allow access to their sites and premises, including to external persons or bodies, and must ensure that information requested is readily available.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

On the basis of the review findings, a 'review report' will be drawn up.

The *Agency or the* Commission will formally notify the review report to the coordinator or beneficiary concerned, which has 30 days to formally notify observations (**'contradictory review procedure'**).

Reviews (including review reports) are in the language of the Agreement.

22.1.3 Right to carry out audits

The *Agency or the* Commission may — during the implementation of the action or afterwards — carry out audits on the proper implementation of the action and compliance with the obligations under the Agreement.

Audits may be started **up to two years after the payment of the balance**. They will be formally notified to the coordinator or beneficiary concerned and will be considered to have started on the date of the formal notification.

If the audit is carried out on a third party (see Articles 10 to 16), the beneficiary concerned must inform the third party.

The *Agency or the* Commission may carry out audits directly (using its own staff) or indirectly (using external persons or bodies appointed to do so). It will inform the coordinator or beneficiary concerned

of the identity of the external persons or bodies. They have the right to object to the appointment on grounds of commercial confidentiality.

The coordinator or beneficiary concerned must provide — within the deadline requested — any information (including complete accounts, individual salary statements or other personal data) to verify compliance with the Agreement. The *Agency or the* Commission may request beneficiaries to provide such information to it directly.

For **on-the-spot** audits, the beneficiaries must allow access to their sites and premises, including to external persons or bodies, and must ensure that information requested is readily available.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

On the basis of the audit findings, a 'draft audit report' will be drawn up.

The *Agency or the* Commission will formally notify the draft audit report to the coordinator or beneficiary concerned, which has 30 days to formally notify observations ('**contradictory audit procedure**'). This period may be extended by the *Agency or the* Commission in justified cases.

The 'final audit report' will take into account observations by the coordinator or beneficiary concerned. The report will be formally notified to it.

Audits (including audit reports) are in the language of the Agreement.

The *Agency or the* Commission may also access the beneficiaries' statutory records for the periodical assessment of unit costs or flat-rate amounts.

22.2 Investigations by the European Anti-Fraud Office (OLAF)

Under Regulations No $883/2013^{15}$ and No $2185/96^{16}$ (and in accordance with their provisions and procedures), the European Anti-Fraud Office (OLAF) may — at any moment during implementation of the action or afterwards — carry out investigations, including on-the-spot checks and inspections, to establish whether there has been fraud, corruption or any other illegal activity affecting the financial interests of the EU.

22.3 Checks and audits by the European Court of Auditors (ECA)

Under Article 287 of the Treaty on the Functioning of the European Union (TFEU) and Article 161 of the Financial Regulation No 966/2012¹⁷, the European Court of Auditors (ECA) may — at any moment during implementation of the action or afterwards — carry out audits.

¹⁵ Regulation (EU, Euratom) No 883/2013 of the European Parliament and of the Council of 11 September 2013 concerning investigations conducted by the European Anti-Fraud Office (OLAF) and repealing Regulation (EC) No 1073/1999 of the European Parliament and of the Council and Council Regulation (Euratom) No 1074/1999 (OJ L 248, 18.09.2013, p. 1).

¹⁶ Council Regulation (Euratom, EC) No 2185/1996 of 11 November 1996 concerning on-the-spot checks and inspections carried out by the Commission in order to protect the European Communities' financial interests against fraud and other irregularities (OJ L 292, 15.11.1996, p. 2).

¹⁷ Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002 (OJ L 298, 26.10.2012, p. 1).

The ECA has the right of access for the purpose of checks and audits.

22.4 Checks, reviews, audits and investigations for international organisations

Not applicable

22.5 Consequences of findings in checks, reviews, audits and investigations — Extension of findings

22.5.1 Findings in this grant

Findings in checks, reviews, audits or investigations carried out in the context of this grant may lead to the rejection of ineligible costs (see Article 42), reduction of the grant (see Article 43), recovery of undue amounts (see Article 44) or to any of the other measures described in Chapter 6.

Rejection of costs or reduction of the grant after the payment of the balance will lead to a revised final grant amount (see Article 5.4).

Findings in checks, reviews, audits or investigations may lead to a request for amendment for the modification of Annex 1 (see Article 55).

Checks, reviews, audits or investigations that find systemic or recurrent errors, irregularities, fraud or breach of obligations may also lead to consequences in other EU or Euratom grants awarded under similar conditions ('extension of findings from this grant to other grants').

Moreover, findings arising from an OLAF investigation may lead to criminal prosecution under national law.

22.5.2 Findings in other grants

The *Agency or the* Commission may extend findings from other grants to this grant ('**extension of findings from other grants to this grant**'), if:

- (a) the beneficiary concerned is found, in other EU or Euratom grants awarded under similar conditions, to have committed systemic or recurrent errors, irregularities, fraud or breach of obligations that have a material impact on this grant and
- (b) those findings are formally notified to the beneficiary concerned together with the list of grants affected by the findings no later than two years after the payment of the balance of this grant.

The extension of findings may lead to the rejection of costs (see Article 42), reduction of the grant (see Article 43), recovery of undue amounts (see Article 44), suspension of payments (see Article 48), suspension of the action implementation (see Article 49) or termination (see Article 50).

22.5.3 Procedure

The *Agency or the* Commission will formally notify the beneficiary concerned the systemic or recurrent errors and its intention to extend these audit findings, together with the list of grants affected.

22.5.3.1 If the findings concern **eligibility of costs**: the formal notification will include:

- (a) an invitation to submit observations on the list of grants affected by the findings;
- (b) the request to submit revised financial statements for all grants affected;
- (c) the **correction rate for extrapolation** established by the *Agency or the* Commission on the basis of the systemic or recurrent errors, to calculate the amounts to be rejected if the beneficiary concerned:
 - (i) considers that the submission of revised financial statements is not possible or practicable or
 - (ii) does not submit revised financial statements.

The beneficiary concerned has 90 days from receiving notification to submit observations, revised financial statements or to propose a duly substantiated **alternative correction method**. This period may be extended by the *Agency or the* Commission in justified cases.

The amounts to be rejected will be determined on the basis of the revised financial statements, subject to their approval.

If the *Agency or the* Commission does not receive any observations or revised financial statements, does not accept the observations or the proposed alternative correction method or does not approve the revised financial statements, it will formally notify the beneficiary concerned the application of the initially notified correction rate for extrapolation.

If the *Agency or the* Commission accepts the alternative correction method proposed by the beneficiary concerned, it will formally notify the application of the accepted alternative correction method.

22.5.3.2 If the findings concern **improper implementation** or a **breach of another obligation**: the formal notification will include:

- (a) an invitation to submit observations on the list of grants affected by the findings and
- (b) the flat-rate the *Agency or the* Commission intends to apply according to the principle of proportionality.

The beneficiary concerned has 90 days from receiving notification to submit observations or to propose a duly substantiated alternative flat-rate.

If the *Agency or the* Commission does not receive any observations or does not accept the observations or the proposed alternative flat-rate, it will formally notify the beneficiary concerned the application of the initially notified flat-rate.

If the *Agency or the* Commission accepts the alternative flat-rate proposed by the beneficiary concerned, it will formally notify the application of the accepted alternative flat-rate.

22.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, any insufficiently substantiated costs will be ineligible (see Article 6) and will be rejected (see Article 42).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 23 — EVALUATION OF THE IMPACT OF THE ACTION

23.1 Right to evaluate the impact of the action

The *Agency or the* Commission may carry out interim and final evaluations of the impact of the action measured against the objective of the *EU* programme.

Evaluations may be started during implementation of the action and up to *five* years after the payment of the balance. The evaluation is considered to start on the date of the formal notification to the coordinator or beneficiaries.

The *Agency or the* Commission may make these evaluations directly (using its own staff) or indirectly (using external bodies or persons it has authorised to do so).

The coordinator or beneficiaries must provide any information relevant to evaluate the impact of the action, including information in electronic format.

23.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the *Agency* may apply the measures described in Chapter 6.

SECTION 3 RIGHTS AND OBLIGATIONS RELATED TO BACKGROUND AND RESULTS

SUBSECTION 1 GENERAL

ARTICLE 23a — MANAGEMENT OF INTELLECTUAL PROPERTY

23a.1 Obligation to take measures to implement the Commission Recommendation on the management of intellectual property in knowledge transfer activities

Beneficiaries that are universities or other public research organisations must take measures to implement the principles set out in Points 1 and 2 of the Code of Practice annexed to the Commission Recommendation on the management of intellectual property in knowledge transfer activities¹⁸.

This does not change the obligations set out in Subsections 2 and 3 of this Section.

The beneficiaries must ensure that researchers and third parties involved in the action are aware of them.

23a.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the *Agency* may apply any of the measures described in Chapter 6.

¹⁸ Commission Recommendation C (2008) 1329 of 10.4.2008 on the management of intellectual property in knowledge transfer activities and the Code of Practice for universities and other public research institutions attached to this recommendation.

SUBSECTION 2 RIGHTS AND OBLIGATIONS RELATED TO BACKGROUND

ARTICLE 24 — AGREEMENT ON BACKGROUND

24.1 Agreement on background

The beneficiaries must identify and agree (in writing) on the background for the action (**'agreement on background**').

'Background' means any data, know-how or information — whatever its form or nature (tangible or intangible), including any rights such as intellectual property rights — that:

- (a) is held by the beneficiaries before they acceded to the Agreement, and
- (b) is needed to implement the action or exploit the results.

24.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 25 — ACCESS RIGHTS TO BACKGROUND

25.1 Exercise of access rights — Waiving of access rights — No sub-licensing

To exercise access rights, this must first be requested in writing ('request for access').

'Access rights' means rights to use results or background under the terms and conditions laid down in this Agreement.

Waivers of access rights are not valid unless in writing.

Unless agreed otherwise, access rights do not include the right to sub-license.

25.2 Access rights for other beneficiaries, for implementing their own tasks under the action

The beneficiaries must give each other access — on a royalty-free basis — to background needed to implement their own tasks under the action, unless the beneficiary that holds the background has — before acceding to the Agreement —:

- (a) informed the other beneficiaries that access to its background is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel), or
- (b) agreed with the other beneficiaries that access would not be on a royalty-free basis.

25.3 Access rights for other beneficiaries, for exploiting their own results

The beneficiaries must give each other access — under fair and reasonable conditions — to background needed for exploiting their own results, unless the beneficiary that holds the background has — before acceding to the Agreement — informed the other beneficiaries that access to its

background is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel).

'**Fair and reasonable conditions**' means appropriate conditions, including possible financial terms or royalty-free conditions, taking into account the specific circumstances of the request for access, for example the actual or potential value of the results or background to which access is requested and/or the scope, duration or other characteristics of the exploitation envisaged.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

25.4 Access rights for affiliated entities

Unless otherwise agreed in the consortium agreement, access to background must also be given — under fair and reasonable conditions (see above; Article 25.3) and unless it is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel) — to affiliated entities¹⁹ established in an EU Member State or '**associated country**'²⁰, if this is needed to exploit the results generated by the beneficiaries to which they are affiliated.

Unless agreed otherwise (see above; Article 25.1), the affiliated entity concerned must make the request directly to the beneficiary that holds the background.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

25.5 Access rights for third parties

Not applicable

25.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

'Control' may take any of the following forms:

 (a) the same public investment corporation, institutional investor or venture-capital company has a direct or indirect holding of more than 50% of the nominal value of the issued share capital or a majority of voting rights of the shareholders or associates;

¹⁹ For the definition, see Article 2.1(2) of the Rules for Participation Regulation No 1290/2013: **'affiliated entity**' means any legal entity that is under the direct or indirect control of a participant, or under the same direct or indirect control as the participant, or that is directly or indirectly controlling a participant.

⁽a) the direct or indirect holding of more than 50% of the nominal value of the issued share capital in the legal entity concerned, or of a majority of the voting rights of the shareholders or associates of that entity;

⁽b) the direct or indirect holding, in fact or in law, of decision-making powers in the legal entity concerned.

However the following relationships between legal entities shall not in themselves be deemed to constitute controlling relationships:

⁽b) the legal entities concerned are owned or supervised by the same public body.

²⁰ For the definition, see Article 2.1(3) of the Rules for Participation Regulation No 1290/2013: 'associated country' means a third country which is party to an international agreement with the Union, as identified in Article 7 of Horizon 2020 Framework Programme Regulation No 1291/2013. Article 7 sets out the conditions for association of non-EU countries to Horizon 2020.

SUBSECTION 3 RIGHTS AND OBLIGATIONS RELATED TO RESULTS

ARTICLE 26 — OWNERSHIP OF RESULTS

26.1 Ownership by the beneficiary that generates the results

Results are owned by the beneficiary that generates them.

'Results' means any (tangible or intangible) output of the action such as data, knowledge or information — whatever its form or nature, whether it can be protected or not — that is generated in the action, as well as any rights attached to it, including intellectual property rights.

26.2 Joint ownership by several beneficiaries

Two or more beneficiaries own results jointly if:

- (a) they have jointly generated them and
- (b) it is not possible to:
 - (i) establish the respective contribution of each beneficiary, or
 - (ii) separate them for the purpose of applying for, obtaining or maintaining their protection (see Article 27).

The joint owners must agree (in writing) on the allocation and terms of exercise of their joint ownership ('joint ownership agreement'), to ensure compliance with their obligations under this Agreement.

Unless otherwise agreed in the joint ownership agreement, each joint owner may grant non-exclusive licences to third parties to exploit jointly-owned results (without any right to sub-license), if the other joint owners are given:

- (a) at least 45 days advance notice and
- (b) fair and reasonable compensation.

Once the results have been generated, joint owners may agree (in writing) to apply another regime than joint ownership (such as, for instance, transfer to a single owner (see Article 30) with access rights for the others).

26.3 Rights of third parties (including personnel)

If third parties (including personnel) may claim rights to the results, the beneficiary concerned must ensure that it complies with its obligations under the Agreement.

If a third party generates results, the beneficiary concerned must obtain all necessary rights (transfer, licences or other) from the third party, in order to be able to respect its obligations as if those results were generated by the beneficiary itself.

If obtaining the rights is impossible, the beneficiary must refrain from using the third party to generate the results.

26.4 Agency ownership, to protect results

26.4.1 *The Agency* may — with the consent of the beneficiary concerned — assume ownership of results to protect them, if a beneficiary intends — up to four years after the period set out in Article 3 — to disseminate its results without protecting them, except in any of the following cases:

- (a) the lack of protection is because protecting the results is not possible, reasonable or justified (given the circumstances);
- (b) the lack of protection is because there is a lack of potential for commercial or industrial exploitation, or
- (c) the beneficiary intends to transfer the results to another beneficiary or third party established in an EU Member State or associated country, which will protect them.

Before the results are disseminated and unless any of the cases above under Points (a), (b) or (c) applies, the beneficiary must formally notify the *Agency* and at the same time inform it of any reasons for refusing consent. The beneficiary may refuse consent only if it can show that its legitimate interests would suffer significant harm.

If the *Agency* decides to assume ownership, it will formally notify the beneficiary concerned within 45 days of receiving notification.

No dissemination relating to these results may before the end of this period or, if the *Agency* takes a positive decision, until it has taken the necessary steps to protect the results.

26.4.2 *The Agency* may — with the consent of the beneficiary concerned — assume ownership of results to protect them, if a beneficiary intends — up to four years after the period set out in Article 3 — to stop protecting them or not to seek an extension of protection, except in any of the following cases:

- (a) the protection is stopped because of a lack of potential for commercial or industrial exploitation;
- (b) an extension would not be justified given the circumstances.

A beneficiary that intends to stop protecting results or not seek an extension must — unless any of the cases above under Points (a) or (b) applies — formally notify the *Agency* at least 60 days before the protection lapses or its extension is no longer possible and at the same time inform it of any reasons for refusing consent. The beneficiary may refuse consent only if it can show that its legitimate interests would suffer significant harm.

If the *Agency* decides to assume ownership, it will formally notify the beneficiary concerned within 45 days of receiving notification.

26.5 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to the any of the other measures described in Chapter 6.

ARTICLE 27 — PROTECTION OF RESULTS — VISIBILITY OF EU FUNDING

27.1 Obligation to protect the results

Each beneficiary must examine the possibility of protecting its results and must adequately protect them — for an appropriate period and with appropriate territorial coverage — if:

- (a) the results can reasonably be expected to be commercially or industrially exploited and
- (b) protecting them is possible, reasonable and justified (given the circumstances).

When deciding on protection, the beneficiary must consider its own legitimate interests and the legitimate interests (especially commercial) of the other beneficiaries.

27.2 Agency ownership, to protect the results

If a beneficiary intends not to protect its results, to stop protecting them or not seek an extension of protection, *the Agency* may — under certain conditions (see Article 26.4) — assume ownership to ensure their (continued) protection.

27.3 Information on EU funding

Applications for protection of results (including patent applications) filed by or on behalf of a beneficiary must—unless the *Agency* requests or agrees otherwise or unless it is impossible—include the following:

"The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731198".

27.4 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 28 — EXPLOITATION OF RESULTS

28.1 Obligation to exploit the results

Each beneficiary must — up to four years after the period set out in Article 3 — take measures aiming to ensure '**exploitation**' of its results (either directly or indirectly, in particular through transfer or licensing; see Article 30) by:

- (a) using them in further research activities (outside the action);
- (b) developing, creating or marketing a product or process;
- (c) creating and providing a service, or
- (d) using them in standardisation activities.

This does not change the security obligations in Article 37, which still apply.

28.2 Results that could contribute to European or international standards — Information on EU funding

If results are incorporated in a standard, the beneficiary concerned must — unless the *Agency* requests or agrees otherwise or unless it is impossible — ask the standardisation body to include the following statement in (information related to) the standard:

"Results incorporated in this standard received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731198".

28.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced in accordance with Article 43.

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 29 — DISSEMINATION OF RESULTS — OPEN ACCESS — VISIBILITY OF EU FUNDING

29.1 Obligation to disseminate results

Unless it goes against their legitimate interests, each beneficiary must — as soon as possible — 'disseminate' its results by disclosing them to the public by appropriate means (other than those resulting from protecting or exploiting the results), including in scientific publications (in any medium).

This does not change the obligation to protect results in Article 27, the confidentiality obligations in Article 36, the security obligations in Article 37 or the obligations to protect personal data in Article 39, all of which still apply.

A beneficiary that intends to disseminate its results must give advance notice to the other beneficiaries of — unless agreed otherwise — at least 45 days, together with sufficient information on the results it will disseminate.

Any other beneficiary may object within — unless agreed otherwise — 30 days of receiving notification, if it can show that its legitimate interests in relation to the results or background would be significantly harmed. In such cases, the dissemination may not take place unless appropriate steps are taken to safeguard these legitimate interests.

If a beneficiary intends not to protect its results, it may — under certain conditions (see Article 26.4.1) — need to formally notify the *Agency* before dissemination takes place.

29.2 Open access to scientific publications

Each beneficiary must ensure open access (free of charge online access for any user) to all peer-reviewed scientific publications relating to its results.

In particular, it must:

(a) as soon as possible and at the latest on publication, deposit a machine-readable electronic copy of the published version or final peer-reviewed manuscript accepted for publication in a repository for scientific publications;

Moreover, the beneficiary must aim to deposit at the same time the research data needed to validate the results presented in the deposited scientific publications.

- (b) ensure open access to the deposited publication via the repository at the latest:
 - (i) on publication, if an electronic version is available for free via the publisher, or
 - (ii) within six months of publication (twelve months for publications in the social sciences and humanities) in any other case.
- (c) ensure open access via the repository to the bibliographic metadata that identify the deposited publication.

The bibliographic metadata must be in a standard format and must include all of the following:

- the terms "European Union (EU)" and "Horizon 2020";
- the name of the action, acronym and grant number;
- the publication date, and length of embargo period if applicable, and
- a persistent identifier.

29.3 Open access to research data

Regarding the digital research data generated in the action ('data'), the beneficiaries must:

- (a) deposit in a research data repository and take measures to make it possible for third parties to access, mine, exploit, reproduce and disseminate free of charge for any user the following:
 - (i) the data, including associated metadata, needed to validate the results presented in scientific publications as soon as possible;
 - (ii) other data, including associated metadata, as specified and within the deadlines laid down in the 'data management plan' (see Annex 1);
- (b) provide information via the repository about tools and instruments at the disposal of the beneficiaries and necessary for validating the results (and where possible provide the tools and instruments themselves).

This does not change the obligation to protect results in Article 27, the confidentiality obligations in Article 36, the security obligations in Article 37 or the obligations to protect personal data in Article 39, all of which still apply.

As an exception, the beneficiaries do not have to ensure open access to specific parts of their research data if the achievement of the action's main objective, as described in Annex 1, would be jeopardised by

making those specific parts of the research data openly accessible. In this case, the data management plan must contain the reasons for not giving access.

29.4 Information on EU funding — Obligation and right to use the EU emblem

Unless the *Agency* requests or agrees otherwise or unless it is impossible, any dissemination of results (in any form, including electronic) must:

- (a) display the EU emblem and
- (b) include the following text:

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731198".

When displayed together with another logo, the EU emblem must have appropriate prominence.

For the purposes of their obligations under this Article, the beneficiaries may use the EU emblem without first obtaining approval from the *Agency*.

This does not however give them the right to exclusive use.

Moreover, they may not appropriate the EU emblem or any similar trademark or logo, either by registration or by any other means.

29.5 Disclaimer excluding Agency responsibility

Any dissemination of results must indicate that it reflects only the author's view and that the *Agency* is not responsible for any use that may be made of the information it contains.

29.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 30 — TRANSFER AND LICENSING OF RESULTS

30.1 Transfer of ownership

Each beneficiary may transfer ownership of its results.

It must however ensure that its obligations under Articles 26.2, 26.4, 27, 28, 29, 30 and 31 also apply to the new owner and that this owner has the obligation to pass them on in any subsequent transfer.

This does not change the security obligations in Article 37, which still apply.

Unless agreed otherwise (in writing) for specifically-identified third parties or unless impossible under applicable EU and national laws on mergers and acquisitions, a beneficiary that intends to transfer ownership of results must give at least 45 days advance notice (or less if agreed in writing) to the other beneficiaries that still have (or still may request) access rights to the results. This notification

must include sufficient information on the new owner to enable any beneficiary concerned to assess the effects on its access rights.

Unless agreed otherwise (in writing) for specifically-identified third parties, any other beneficiary may object within 30 days of receiving notification (or less if agreed in writing), if it can show that the transfer would adversely affect its access rights. In this case, the transfer may not take place until agreement has been reached between the beneficiaries concerned.

30.2 Granting licenses

Each beneficiary may grant licences to its results (or otherwise give the right to exploit them), if:

- (a) this does not impede the rights under Article 31 and
- (b) not applicable.

In addition to Points (a) and (b), exclusive licences for results may be granted only if all the other beneficiaries concerned have waived their access rights (see Article 31.1).

This does not change the dissemination obligations in Article 29 or security obligations in Article 37, which still apply.

30.3 Agency right to object to transfers or licensing

Not applicable

30.4 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 31 — ACCESS RIGHTS TO RESULTS

31.1 Exercise of access rights — Waiving of access rights — No sub-licensing

The conditions set out in Article 25.1 apply.

The obligations set out in this Article do not change the security obligations in Article 37, which still apply.

31.2 Access rights for other beneficiaries, for implementing their own tasks under the action

The beneficiaries must give each other access — on a royalty-free basis — to results needed for implementing their own tasks under the action.

31.3 Access rights for other beneficiaries, for exploiting their own results

The beneficiaries must give each other — under fair and reasonable conditions (see Article 25.3) — access to results needed for exploiting their own results.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

31.4 Access rights of affiliated entities

Unless agreed otherwise in the consortium agreement, access to results must also be given — under fair and reasonable conditions (Article 25.3) — to affiliated entities established in an EU Member State or associated country, if this is needed for those entities to exploit the results generated by the beneficiaries to which they are affiliated.

Unless agreed otherwise (see above; Article 31.1), the affiliated entity concerned must make any such request directly to the beneficiary that owns the results.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

31.5 Access rights for the EU institutions, bodies, offices or agencies and EU Member States

The beneficiaries must give access to their results — *on a royalty-free basis* — *to EU institutions, bodies, offices or agencies, for developing, implementing or monitoring EU policies or programmes.*

Such access rights are limited to non-commercial and non-competitive use.

This does not change the right to use any material, document or information received from the beneficiaries for communication and publicising activities (see Article 38.2).

31.6 Access rights for third parties

Not applicable

31.7 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

SECTION 4 OTHER RIGHTS AND OBLIGATIONS

ARTICLE 32 — RECRUITMENT AND WORKING CONDITIONS FOR RESEARCHERS

32.1 Obligation to take measures to implement the European Charter for Researchers and Code of Conduct for the Recruitment of Researchers

The beneficiaries must take all measures to implement the principles set out in the Commission Recommendation on the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers²², in particular regarding:

²² Commission Recommendation 2005/251/EC of 11 March 2005 on the European Charter for Researchers and on a Code of Conduct for the Recruitment of Researchers (OJ L 75, 22.3.2005, p. 67).

Associated with document Ref. Ares(2016)5910251 - 13/10/2016

- working conditions;
- transparent recruitment processes based on merit, and
- career development.

The beneficiaries must ensure that researchers and third parties involved in the action are aware of them.

32.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the *Agency* may apply any of the measures described in Chapter 6.

ARTICLE 33 — GENDER EQUALITY

33.1 Obligation to aim for gender equality

The beneficiaries must take all measures to promote equal opportunities between men and women in the implementation of the action. They must aim, to the extent possible, for a gender balance at all levels of personnel assigned to the action, including at supervisory and managerial level.

33.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the *Agency* may apply any of the measures described in Chapter 6.

ARTICLE 34 — ETHICS

34.1 Obligation to comply with ethical principles

The beneficiaries must carry out the action in compliance with:

- (a) ethical principles (including the highest standards of research integrity as set out, for instance, in the European Code of Conduct for Research Integrity²³ and including, in particular, avoiding fabrication, falsification, plagiarism or other research misconduct) and
- (b) applicable international, EU and national law.

Funding will not be granted for activities carried out outside the EU if they are prohibited in all Member States.

The beneficiaries must ensure that the activities under the action have an exclusive focus on civil applications.

The beneficiaries must ensure that the activities under the action do not:

(a) aim at human cloning for reproductive purposes;

http://www.esf.org/fileadmin/Public_documents/Publications/Code_Conduct_ResearchIntegrity.pdf

- (b) intend to modify the genetic heritage of human beings which could make such changes heritable (with the exception of research relating to cancer treatment of the gonads, which may be financed), or
- (c) intend to create human embryos solely for the purpose of research or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer.

34.2 Activities raising ethical issues

Activities raising ethical issues must comply with the 'ethics requirements' set out in Annex 1.

Before the beginning of an activity raising an ethical issue, the coordinator must submit (see Article 52) to the *Agency* copy of:

- (a) any ethics committee opinion required under national law and
- (b) any notification or authorisation for activities raising ethical issues required under national law.

If these documents are not in English, the coordinator must also submit an English summary of the submitted opinions, notifications and authorisations (containing, if available, the conclusions of the committee or authority concerned).

If these documents are specifically requested for the action, the request must contain an explicit reference to the action title. The coordinator must submit a declaration by each beneficiary concerned that all the submitted documents cover the action tasks.

34.3 Activities involving human embryos or human embryonic stem cells

Activities involving research on human embryos or human embryonic stem cells may be carried out only if:

- they are set out in Annex 1 or
- the coordinator has obtained explicit approval (in writing) from the Agency (see Article 52).

34.4 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43) and the Agreement or participation of the beneficiary may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 35 — CONFLICT OF INTERESTS

35.1 Obligation to avoid a conflict of interests

The beneficiaries must take all measures to prevent any situation where the impartial and objective implementation of the action is compromised for reasons involving economic interest, political or national affinity, family or emotional ties or any other shared interest (**'conflict of interests'**).

They must formally notify to the *Agency* without delay any situation constituting or likely to lead to a conflict of interests and immediately take all the necessary steps to rectify this situation.

The *Agency* may verify that the measures taken are appropriate and may require additional measures to be taken by a specified deadline.

35.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43) and the Agreement or participation of the beneficiary may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 36 — CONFIDENTIALITY

36.1 General obligation to maintain confidentiality

During implementation of the action and for four years after the period set out in Article 3, the parties must keep confidential any data, documents or other material (in any form) that is identified as confidential at the time it is disclosed ('**confidential information**').

If a beneficiary requests, the *Agency* may agree to keep such information confidential for an additional period beyond the initial four years.

If information has been identified as confidential only orally, it will be considered to be confidential only if this is confirmed in writing within 15 days of the oral disclosure.

Unless otherwise agreed between the parties, they may use confidential information only to implement the Agreement.

The beneficiaries may disclose confidential information to their personnel or third parties involved in the action only if they:

- (a) need to know to implement the Agreement and
- (b) are bound by an obligation of confidentiality.

This does not change the security obligations in Article 37, which still apply.

The *Agency* may disclose confidential information to its staff, other EU institutions and bodies or third parties, if:

- (a) this is necessary to implement the Agreement or safeguard the EU's financial interests and
- (b) the recipients of the information are bound by an obligation of confidentiality.

Under the conditions set out in Article 4 of the Rules for Participation Regulation No 1290/2013²⁴, the Commission must moreover make available information on the results to other EU institutions, bodies, offices or agencies as well as Member States or associated countries.

The confidentiality obligations no longer apply if:

²⁴ Regulation (EU) No 1290/2013 of the European Parliament and of the Council of 11 December 2013 laying down the rules for participation and dissemination in "Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020)" (OJ L 347, 20.12.2013 p.81).

- (a) the disclosing party agrees to release the other party;
- (b) the information was already known by the recipient or is given to him without obligation of confidentiality by a third party that was not bound by any obligation of confidentiality;
- (c) the recipient proves that the information was developed without the use of confidential information;
- (d) the information becomes generally and publicly available, without breaching any confidentiality obligation, or
- (e) the disclosure of the information is required by EU or national law.

36.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 37 — SECURITY-RELATED OBLIGATIONS

37.1 Results with a security recommendation

Not applicable

37.2 Classified results

Not applicable

37.3 Activities involving dual-use goods or dangerous materials and substances

Not applicable

37.4 Consequences of non-compliance

Not applicable

ARTICLE 38 — PROMOTING THE ACTION — VISIBILITY OF EU FUNDING

38.1 Communication activities by beneficiaries

38.1.1 Obligation to promote the action and its results

The beneficiaries must promote the action and its results, by providing targeted information to multiple audiences (including the media and the public) in a strategic and effective manner.

This does not change the dissemination obligations in Article 29, the confidentiality obligations in Article 36 or the security obligations in Article 37, all of which still apply.

Before engaging in a communication activity expected to have a major media impact, the beneficiaries must inform the *Agency* (see Article 52).

38.1.2 Information on EU funding — Obligation and right to use the EU emblem

Unless the *Agency* requests or agrees otherwise or unless it is impossible, any communication activity related to the action (including in electronic form, via social media, etc.) and any infrastructure, equipment and major results funded by the grant must:

- (a) display the EU emblem and
- (b) include the following text:

For communication activities: *"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731198"*.

For infrastructure, equipment and major results: "This [infrastructure][equipment][insert type of result] is part of a project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731198".

When displayed together with another logo, the EU emblem must have appropriate prominence.

For the purposes of their obligations under this Article, the beneficiaries may use the EU emblem without first obtaining approval from the *Agency*.

This does not, however, give them the right to exclusive use.

Moreover, they may not appropriate the EU emblem or any similar trademark or logo, either by registration or by any other means.

38.1.3 Disclaimer excluding *Agency* responsibility

Any communication activity related to the action must indicate that it reflects only the author's view and that the *Agency* is not responsible for any use that may be made of the information it contains.

38.2 Communication activities by the Agency

38.2.1 Right to use beneficiaries' materials, documents or information

The *Agency* may use, for its communication and publicising activities, information relating to the action, documents notably summaries for publication and public deliverables as well as any other material, such as pictures or audio-visual material that it receives from any beneficiary (including in electronic form).

This does not change the confidentiality obligations in Article 36 and the security obligations in Article 37, all of which still apply.

However, if the *Agency's* use of these materials, documents or information would risk compromising legitimate interests, the beneficiary concerned may request the *Agency* not to use it (see Article 52).

The right to use a beneficiary's materials, documents and information includes:

(a) **use for its own purposes** (in particular, making them available to persons working for the *Agency* or any other EU institution, body, office or agency or body or institutions in EU Member States; and copying or reproducing them in whole or in part, in unlimited numbers);

- (b) **distribution to the public** (in particular, publication as hard copies and in electronic or digital format, publication on the internet, as a downloadable or non-downloadable file, broadcasting by any channel, public display or presentation, communicating through press information services, or inclusion in widely accessible databases or indexes);
- (c) editing or redrafting for communication and publicising activities (including shortening, summarising, inserting other elements (such as meta-data, legends, other graphic, visual, audio or text elements), extracting parts (e.g. audio or video files), dividing into parts, use in a compilation);

(d) translation;

- (e) giving access in response to individual requests under Regulation No 1049/2001²⁵, without the right to reproduce or exploit;
- (f) **storage** in paper, electronic or other form;
- (g) archiving, in line with applicable document-management rules, and
- (h) the right to authorise **third parties** to act on its behalf or sub-license the modes of use set out in Points (b),(c),(d) and (f) to third parties if needed for the communication and publicising activities of the *Agency*.

If the right of use is subject to rights of a third party (including personnel of the beneficiary), the beneficiary must ensure that it complies with its obligations under this Agreement (in particular, by obtaining the necessary approval from the third parties concerned).

Where applicable (and if provided by the beneficiaries), the *Agency* will insert the following information:

"[©] – [year] – [name of the copyright owner]. All rights reserved. Licensed to the *Innovation and Networks Executive Agency (INEA)* under conditions."

38.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

²⁵ Regulation (EC) No 1049/2001 of the European Parliament and of the Council of 30 May 2001 regarding public access to European Parliament, Council and Commission documents, OJ L 145, 31.5.2001, p. 43.

ARTICLE 39 — PROCESSING OF PERSONAL DATA

39.1 Processing of personal data by the Agency and the Commission

Any personal data under the Agreement will be processed by the *Agency or the* Commission under Regulation No 45/2001²⁶ and according to the 'notifications of the processing operations' to the Data Protection Officer (DPO) of the *Agency or the* Commission (publicly accessible in the DPO register).

Such data will be processed by the '**data controller**' of the *Agency or the* Commission for the purposes of implementing, managing and monitoring the Agreement or protecting the financial interests of the EU or Euratom (including checks, reviews, audits and investigations; see Article 22).

The persons whose personal data are processed have the right to access and correct their own personal data. For this purpose, they must send any queries about the processing of their personal data to the data controller, via the contact point indicated in the 'service specific privacy statement(s) (SSPS)' that are published on the *Agency and the* Commission websites.

They also have the right to have recourse at any time to the European Data Protection Supervisor (EDPS).

39.2 Processing of personal data by the beneficiaries

The beneficiaries must process personal data under the Agreement in compliance with applicable EU and national law on data protection (including authorisations or notification requirements).

The beneficiaries may grant their personnel access only to data that is strictly necessary for implementing, managing and monitoring the Agreement.

The beneficiaries must inform the personnel whose personal data are collected and processed by the *Agency or the* Commission. For this purpose, they must provide them with the service specific privacy statement (SSPS) (see above), before transmitting their data to the *Agency or the* Commission.

39.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Article 39.2, the *Agency* may apply any of the measures described in Chapter 6.

ARTICLE 40 — ASSIGNMENTS OF CLAIMS FOR PAYMENT AGAINST THE AGENCY

The beneficiaries may not assign any of their claims for payment against the *Agency* to any third party, except if approved by the *Agency* on the basis of a reasoned, written request by the coordinator (on behalf of the beneficiary concerned).

If the *Agency* has not accepted the assignment or the terms of it are not observed, the assignment will have no effect on it.

In no circumstances will an assignment release the beneficiaries from their obligations towards the *Agency*.

²⁶ Regulation (EC) No 45/2001 of the European Parliament and of the Council of 18 December 2000 on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data (OJ L 8, 12.01.2001, p. 1).

CHAPTER 5 DIVISION OF BENEFICIARIES' ROLES AND RESPONSIBILITIES

ARTICLE 41 — DIVISION OF BENEFICIARIES' ROLES AND RESPONSIBILITIES — RELATIONSHIP WITH COMPLEMENTARY BENEFICIARIES — RELATIONSHIP WITH PARTNERS OF A JOINT ACTION

41.1 Roles and responsibilities towards the Agency

The beneficiaries have full responsibility for implementing the action and complying with the Agreement.

The beneficiaries are jointly and severally liable for the **technical implementation** of the action as described in Annex 1. If a beneficiary fails to implement its part of the action, the other beneficiaries become responsible for implementing this part (without being entitled to any additional EU funding for doing so), unless the *Agency* expressly relieves them of this obligation.

The financial responsibility of each beneficiary is governed by Articles 44, 45 and 46.

41.2 Internal division of roles and responsibilities

The internal roles and responsibilities of the beneficiaries are divided as follows:

(a) Each **beneficiary** must:

- (i) keep information stored in the 'Beneficiary Register' (via the electronic exchange system) up to date (see Article 17);
- (ii) inform the coordinator immediately of any events or circumstances likely to affect significantly or delay the implementation of the action (see Article 17);
- (iii) submit to the coordinator in good time:
 - individual financial statements for itself and, if required, certificates on the financial statements (see Article 20);
 - the data needed to draw up the technical reports (see Article 20);
 - ethics committee opinions and notifications or authorisations for activities raising ethical issues (see Article 34);
 - any other documents or information required by the *Agency or the* Commission under the Agreement, unless the Agreement requires the beneficiary to submit this information directly to the *Agency or the* Commission.

(b) The coordinator must:

(i) monitor that the action is implemented properly (see Article 7);

- (ii) act as the intermediary for all communications between the beneficiaries and the *Agency* (in particular, providing the *Agency* with the information described in Article 17), unless the Agreement specifies otherwise;
- (iii) request and review any documents or information required by the *Agency* and verify their completeness and correctness before passing them on to the *Agency*;
- (iv) submit the deliverables and reports to the Agency (see Articles 19 and 20);
- (v) ensure that all payments are made to the other beneficiaries without unjustified delay (see Article 21);
- (vi) inform the *Agency* of the amounts paid to each beneficiary, when required under the Agreement (see Articles 44 and 50) or requested by the *Agency*.

The coordinator may not delegate the above-mentioned tasks to any other beneficiary or subcontract them to any third party.

41.3 Internal arrangements between beneficiaries — Consortium agreement

The beneficiaries must have internal arrangements regarding their operation and co-ordination to ensure that the action is implemented properly. These internal arrangements must be set out in a written 'consortium agreement' between the beneficiaries, which may cover:

- internal organisation of the consortium;
- management of access to the electronic exchange system;
- distribution of EU funding;
- additional rules on rights and obligations related to background and results (including whether access rights remain or not, if a beneficiary is in breach of its obligations) (see Section 3 of Chapter 4);
- settlement of internal disputes;
- liability, indemnification and confidentiality arrangements between the beneficiaries.

The consortium agreement must not contain any provision contrary to the Agreement.

41.4 Relationship with complementary beneficiaries — Collaboration agreement

Not applicable

41.5 Relationship with partners of a joint action — Coordination agreement

Not applicable

<u>CHAPTER 6</u> <u>REJECTION OF COSTS — REDUCTION OF THE GRANT — RECOVERY</u> <u>— PENALTIES — DAMAGES — SUSPENSION — TERMINATION — FORCE</u> <u>MAJEURE</u>

<u>SECTION 1</u> <u>REJECTION OF COSTS — REDUCTION OF THE GRANT — RECOVERY</u> <u>— PENALTIES</u>

ARTICLE 42 — REJECTION OF INELIGIBLE COSTS

42.1 Conditions

42.1.1 The *Agency* will — at the time of an **interim payment**, **at the payment of the balance** or **afterwards** — reject any costs which are ineligible (see Article 6), in particular following checks, reviews, audits or investigations (see Article 22).

42.1.2 The rejection may also be based on the **extension of findings from other grants to this grant**, under the conditions set out in Article 22.5.2.

42.2 Ineligible costs to be rejected — Calculation — Procedure

Ineligible costs will be rejected in full.

If the *Agency* rejects costs **without reduction of the grant** (see Article 43) or **recovery of undue amounts** (see Article 44), it will formally notify the coordinator or beneficiary concerned the rejection of costs, the amounts and the reasons why (if applicable, together with the notification of amounts due; see Article 21.5). The coordinator or beneficiary concerned may — within 30 days of receiving notification — formally notify the *Agency* of its disagreement and the reasons why.

If the *Agency* rejects costs with reduction of the grant or recovery of undue amounts, it will formally notify the rejection in the 'pre-information letter' on reduction or recovery set out in Articles 43 and 44.

42.3 Effects

If the *Agency* rejects costs at the time of an **interim payment** or **the payment of the balance**, it will deduct them from the total eligible costs declared, for the action, in the periodic or final summary financial statement (see Articles 20.3 and 20.4). It will then calculate the interim payment or payment of the balance as set out in Articles 21.3 or 21.4.

If the *Agency* — **after an interim payment but before the payment of the balance** — rejects costs declared in a periodic summary financial statement, it will deduct them from the total eligible costs declared, for the action, in the next periodic summary financial statement or in the final summary financial statement. It will then calculate the interim payment or payment of the balance as set out in Articles 21.3 or 21.4.

If the *Agency* rejects costs **after the payment of the balance**, it will deduct the amount rejected from the total eligible costs declared, by the beneficiary, in the final summary financial statement. It will then calculate the revised final grant amount as set out in Article 5.4.

ARTICLE 43 — REDUCTION OF THE GRANT

43.1 Conditions

43.1.1 The *Agency* may — **at the payment of the balance** or **afterwards** — reduce the maximum grant amount (see Article 5.1), if the action has not been implemented properly as described in Annex 1 or another obligation under the Agreement has been breached.

43.1.2 The *Agency* may also reduce the maximum grant amount on the basis of the **extension of findings from other grants to this grant**, under the conditions set out in Article 22.5.2.

43.2 Amount to be reduced — Calculation — Procedure

The amount of the reduction will be proportionate to the improper implementation of the action or to the seriousness of the breach.

Before reduction of the grant, the *Agency* will formally notify a '**pre-information letter**' to the coordinator or beneficiary concerned:

- informing it of its intention to reduce the grant, the amount it intends to reduce and the reasons why and
- inviting it to submit observations within 30 days of receiving notification

If the *Agency* does not receive any observations or decides to pursue reduction despite the observations it has received, it will formally notify **confirmation** of the reduction (if applicable, together with the notification of amounts due; see Article 21).

43.3 Effects

If the *Agency* reduces the grant at the time of **the payment of the balance**, it will calculate the reduced grant amount for the action and then determine the amount due as payment of the balance (see Articles 5.3.4 and 21.4).

If the *Agency* reduces the grant **after the payment of the balance**, it will calculate the revised final grant amount for the beneficiary concerned (see Article 5.4). If the revised final grant amount for the beneficiary concerned is lower than its share of the final grant amount, the *Agency* will recover the difference (see Article 44).

ARTICLE 44 — RECOVERY OF UNDUE AMOUNTS

44.1 Amount to be recovered — Calculation — Procedure

The *Agency* will — after termination of the participation of a beneficiary, at the payment of the balance or afterwards — claim back any amount that was paid but is not due under the Agreement.

Each beneficiary's financial responsibility in case of recovery is limited to its own debt, except for the amount retained for the Guarantee Fund (see Article 21.4).

44.1.1 Recovery after termination of a beneficiary's participation

If recovery takes place after termination of a beneficiary's participation (including the coordinator), the *Agency* will claim back the undue amount from the beneficiary concerned, by formally notifying it a debit note (see Article 50.2 and 50.3). This note will specify the amount to be recovered, the terms and the date for payment.

If payment is not made by the date specified in the debit note, the *Agency or the* Commission will **recover** the amount:

(a) by '**offsetting**' it — without the beneficiary's consent — against any amounts owed to the beneficiary concerned by the *Agency, the* Commission or an*other* executive agency (from the EU or Euratom budget).

In exceptional circumstances, to safeguard the EU's financial interests, the *Agency* may offset before the payment date specified in the debit note;

- (b) not applicable;
- (c) by **taking legal action** (see Article 57) or by **adopting an enforceable decision** under Article 299 of the Treaty on the Functioning of the EU (TFEU) and Article 79(2) of the Financial regulation No 966/2012.

If payment is not made by the date specified in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the payment date in the debit note, up to and including the date the *Agency or the* Commission receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive $2007/64/EC^{27}$ applies.

44.1.2 Recovery at payment of the balance

If the payment of the balance takes the form of a recovery (see Article 21.4), the *Agency* will formally notify a '**pre-information letter**' to the coordinator:

- informing it of its intention to recover, the amount due as the balance and the reasons why;
- specifying that it intends to deduct the amount to be recovered from the amount retained for the Guarantee Fund;
- requesting the coordinator to submit a report on the distribution of payments to the beneficiaries within 30 days of receiving notification, and
- inviting the coordinator to submit observations within 30 days of receiving notification.

²⁷ Directive 2007/64/EC of the European Parliament and of the Council of 13 November 2007 on payment services in the internal market amending Directives 97/7/EC, 2002/65/EC, 2005/60/EC and 2006/48/EC and repealing Directive 97/5/EC (OJ L 319, 05.12.2007, p. 1).

If no observations are submitted or the *Agency* decides to pursue recovery despite the observations it has received, it will **confirm recovery** (together with the notification of amounts due; see Article 21.5) and:

- pay the difference between the amount to be recovered and the amount retained for the Guarantee Fund, **if the difference is positive** or
- formally notify to the coordinator a **debit note** for the difference between the amount to be recovered and the amount retained for the Guarantee Fund, **if the difference is negative**. This note will also specify the terms and the date for payment.

If the coordinator does not repay the *Agency* by the date in the debit note and has not submitted the report on the distribution of payments: the *Agency or the* Commission will **recover** the amount set out in the debit note from the coordinator (see below).

If the coordinator does not repay the *Agency* by the date in the debit note, but has submitted the report on the distribution of payments: the *Agency* will:

(a) identify the beneficiaries for which the amount calculated as follows is negative:

{{{beneficiary's costs declared in the final summary financial statement and approved by the *Agency* multiplied by the reimbursement rate set out in Article 5.2 for the beneficiary concerned}

divided by

the EU contribution for the action calculated according to Article 5.3.1

multiplied by

the final grant amount (see Article 5.3),

minus

{pre-financing and interim payments received by the beneficiary} }.

(b) formally notify to each beneficiary identified according to point (a) a **debit note** specifying the terms and date for payment. The amount of the debit note is calculated as follows:

{ {amount calculated according to point (a) for the beneficiary concerned

divided by

the sum of the amounts calculated according to point (a) for all the beneficiaries identified according to point (a)}

multiplied by

the amount set out in the debit note formally notified to the coordinator}.

If payment is not made by the date specified in the debit note, the Agency will recover the amount:

(a) by '**offsetting**' it — without the beneficiary's consent — against any amounts owed to the beneficiary concerned by the *Agency, the* Commission or an*other* executive agency (from the EU or Euratom budget).

In exceptional circumstances, to safeguard the EU's financial interests, the *Agency* may offset before the payment date specified in the debit note;

- (b) by **drawing on the Guarantee Fund**. The *Agency or the* Commission will formally notify the beneficiary concerned the debit note on behalf of the Guarantee Fund and recover the amount:
 - (i) *not applicable;*
 - (ii) by **taking legal action** (see Article 57) or by **adopting an enforceable decision** under Article 299 of the Treaty on the Functioning of the EU (TFEU) and Article 79(2) of the Financial Regulation No 966/2012.

If payment is not made by the date in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the payment date in the debit note, up to and including the date the *Agency or the* Commission receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC applies.

44.1.3 Recovery of amounts after payment of the balance

If, for a beneficiary, the revised final grant amount (see Article 5.4) is lower than its share of the final grant amount, it must repay the difference to the *Agency*.

The beneficiary's share of the final grant amount is calculated as follows:

{{ {beneficiary's costs declared in the final summary financial statement and approved by the *Agency* multiplied by the reimbursement rate set out in Article 5.2 for the beneficiary concerned}

divided by

the EU contribution for the action calculated according to Article 5.3.1}

multiplied by

the final grant amount (see Article 5.3).

If the coordinator has not distributed amounts received (see Article 21.7), the *Agency* will also recover these amounts.

The Agency will formally notify a pre-information letter to the beneficiary concerned:

- informing it of its intention to recover, the due amount and the reasons why and

- inviting it to submit observations within 30 days of receiving notification.

If no observations are submitted or the *Agency* decides to pursue recovery despite the observations it has received, it will **confirm** the amount to be recovered and formally notify to the beneficiary concerned a **debit note**. This note will also specify the terms and the date for payment.

If payment is not made by the date specified in the debit note, the *Agency* will **recover** the amount:

(a) by '**offsetting**' it — without the beneficiary's consent — against any amounts owed to the beneficiary concerned by the *Agency, the* Commission or an*other* executive agency (from the EU or Euratom budget).

In exceptional circumstances, to safeguard the EU's financial interests, the *Agency* may offset before the payment date specified in the debit note;

- (b) by **drawing on the Guarantee Fund**. The *Agency or the* Commission will formally notify the beneficiary concerned the debit note on behalf of the Guarantee Fund and recover the amount:
 - (i) *not applicable;*
 - (ii) by **taking legal action** (see Article 57) or by **adopting an enforceable decision** under Article 299 of the Treaty on the Functioning of the EU (TFEU) and Article 79(2) of the Financial Regulation No 966/2012.

If payment is not made by the date in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the date for payment in the debit note, up to and including the date the *Agency or the* Commission receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC applies.

ARTICLE 45 — ADMINISTRATIVE AND FINANCIAL PENALTIES

45.1 Conditions

Under Articles 109 and 131(4) of the Financial Regulation No 966/2012, the *Agency* may impose **administrative** and **financial penalties** if a beneficiary:

- (a) has committed substantial errors, irregularities or fraud or is in serious breach of its obligations under the Agreement or
- (b) has made false declarations about information required under the Agreement or for the submission of the proposal (or has not supplied such information).

Each beneficiary is responsible for paying the financial penalties imposed on it.

Under Article 109(3) of the Financial Regulation No 966/2012, the *Agency or the* Commission may — under certain conditions and limits — publish decisions imposing administrative or financial penalties.

45.2 Duration — Amount of penalty — Calculation

Administrative penalties exclude the beneficiary from all contracts and grants financed from the EU or Euratom budget for a maximum of five years from the date the infringement is established by the *Agency*.

If the beneficiary commits another infringement within five years of the date the first infringement is established, the *Agency* may extend the exclusion period up to 10 years.

Financial penalties will be between 2% and 10% of the maximum EU contribution indicated, for the beneficiary concerned, in the estimated budget (see Annex 2).

If the beneficiary commits another infringement within five years of the date the first infringement is established, the *Agency* may increase the rate of financial penalties to between 4% and 20%.

45.3 Procedure

Before applying a penalty, the *Agency* will formally notify the beneficiary concerned:

- informing it of its intention to impose a penalty, its duration or amount and the reasons why and
- inviting it to submit observations within 30 days.

If the *Agency* does not receive any observations or decides to impose the penalty despite of observations it has received, it will formally notify **confirmation** of the penalty to the beneficiary concerned and — in case of financial penalties — deduct the penalty from the payment of the balance or formally notify a **debit note**, specifying the amount to be recovered, the terms and the date for payment.

If payment is not made by the date specified in the debit note, the *Agency or the* Commission may **recover** the amount:

(a) by '**offsetting**' it — without the beneficiary's consent — against any amounts owed to the beneficiary concerned by the *Agency, the* Commission or an*other* executive agency (from the EU or Euratom budget).

In exceptional circumstances, to safeguard the EU's financial interests, the *Agency* may offset before the payment date specified in the debit note;

(b) by **taking legal action** (see Article 57) or by **adopting an enforceable decision** under Article 299 of the Treaty on the Functioning of the EU (TFEU) and Article 79(2) of the Financial Regulation No 966/2012.

If payment is not made by the date in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the payment date in the debit note, up to and including the date the *Agency or the* Commission receives full payment of the amount.

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Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC applies.

SECTION 2 LIABILITY FOR DAMAGES

ARTICLE 46 — LIABILITY FOR DAMAGES

46.1 Liability of the Agency

The *Agency* cannot be held liable for any damage caused to the beneficiaries or to third parties as a consequence of implementing the Agreement, including for gross negligence.

The *Agency* cannot be held liable for any damage caused by any of the beneficiaries or third parties involved in the action, as a consequence of implementing the Agreement.

46.2 Liability of the beneficiaries

46.2.1 Conditions

Except in case of force majeure (see Article 51), the beneficiaries must compensate the *Agency* for any damage it sustains as a result of the implementation of the action or because the action was not implemented in full compliance with the Agreement.

Each beneficiary is responsible for paying the damages claimed from it.

46.2.2 Amount of damages - Calculation

The amount the *Agency* can claim from a beneficiary will correspond to the damage caused by that beneficiary.

46.2.3 Procedure

Before claiming damages, the Agency will formally notify the beneficiary concerned:

- informing it of its intention to claim damages, the amount and the reasons why and
- inviting it to submit observations within 30 days.

If the *Agency* does not receive any observations or decides to claim damages despite the observations it has received, it will formally notify **confirmation** of the claim for damages and a **debit note**, specifying the amount to be recovered, the terms and the date for payment.

If payment is not made by the date specified in the debit note, the *Agency or the* Commission may **recover** the amount:

(a) by '**offsetting**' it — without the beneficiary's consent — against any amounts owed to the beneficiary concerned by the *Agency, the* Commission or an*other* executive agency (from the EU or Euratom budget).

In exceptional circumstances, to safeguard the EU's financial interests, the *Agency* may offset before the payment date specified in the debit note;

(b) by **taking legal action** (see Article 57) or by **adopting an enforceable decision** under Article 299 of the Treaty on the Functioning of the EU (TFEU) and Article 79(2) of the Financial Regulation No 966/2012.

If payment is not made by the date in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the payment date in the debit note, up to and including the date the *Agency or the* Commission receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC applies.

SECTION 3 SUSPENSION AND TERMINATION

ARTICLE 47 — SUSPENSION OF PAYMENT DEADLINE

47.1 Conditions

The *Agency* may — at any moment — suspend the payment deadline (see Article 21.2 to 21.4) if a request for payment (see Article 20) cannot be approved because:

- (a) it does not comply with the provisions of the Agreement (see Article 20);
- (b) the technical reports or financial reports have not been submitted or are not complete or additional information is needed, or
- (c) there is doubt about the eligibility of the costs declared in the financial statements and additional checks, reviews, audits or investigations are necessary.

47.2 Procedure

The Agency will formally notify the coordinator of the suspension and the reasons why.

The suspension will take effect the day notification is sent by the Agency (see Article 52).

If the conditions for suspending the payment deadline are no longer met, the suspension will be **lifted** — and the remaining period will resume.

If the suspension exceeds two months, the coordinator may request the *Agency* if the suspension will continue.

If the payment deadline has been suspended due to the non-compliance of the technical or financial reports (see Article 20) and the revised report or statement is not submitted or was submitted but is

also rejected, the *Agency* may also terminate the Agreement or the participation of the beneficiary (see Article 50.3.1(1)).

ARTICLE 48 — SUSPENSION OF PAYMENTS

48.1 Conditions

The *Agency* may — at any moment — suspend, in whole or in part, the pre-financing payment and interim payments for one or more beneficiaries or the payment of the balance for all beneficiaries, if a beneficiary:

- (a) has committed or is suspected of having committed substantial errors, irregularities, fraud or serious breach of obligations in the award procedure or under this Agreement or
- (b) has committed in other EU or Euratom grants awarded to it under similar conditions systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (extension of findings from other grants to this grant; see Article 22.5.2).

48.2 Procedure

Before suspending payments, the Agency will formally notify the coordinator:

- informing it of its intention to suspend payments and the reasons why and
- inviting it to submit observations within 30 days of receiving notification.

If the *Agency* does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify **confirmation** of the suspension. Otherwise, it will formally notify that the suspension procedure is not continued.

The suspension will take effect the day the confirmation notification is sent by the Agency.

If the conditions for resuming payments are met, the suspension will be **lifted**. The *Agency* will formally notify the coordinator.

During the suspension, the periodic report(s) (see Article 20.3) must not contain any individual financial statements from the beneficiary concerned. When the *Agency* resumes payments, the coordinator may include them in the next periodic report.

The beneficiaries may suspend implementation of the action (see Article 49.1) or terminate the Agreement or the participation of the beneficiary concerned (see Article 50.1 and 50.2).

ARTICLE 49 — SUSPENSION OF THE ACTION IMPLEMENTATION

49.1 Suspension of the action implementation, by the beneficiaries

49.1.1 Conditions

The beneficiaries may suspend implementation of the action or any part of it, if exceptional circumstances — in particular *force majeure* (see Article 51) — make implementation impossible or excessively difficult.

49.1.2 Procedure

The coordinator must immediately formally notify to the *Agency* the suspension (see Article 52), stating:

- the reasons why and
- the expected date of resumption.

The suspension will take effect the day this notification is received by the Agency.

Once circumstances allow for implementation to resume, the coordinator must immediately formally notify the *Agency* and request an **amendment** of the Agreement to set the date on which the action will be resumed, extend the duration of the action and make other changes necessary to adapt the action to the new situation (see Article 55) — unless the Agreement or the participation of a beneficiary has been terminated (see Article 50).

The suspension will be **lifted** with effect from the resumption date set out in the amendment. This date may be before the date on which the amendment enters into force.

Costs incurred during suspension of the action implementation are not eligible (see Article 6).

49.2 Suspension of the action implementation, by the Agency

49.2.1 Conditions

The Agency may suspend implementation of the action or any part of it:

- (a) if a beneficiary has committed or is suspected of having committed substantial errors, irregularities, fraud or serious breach of obligations in the award procedure or under this Agreement;
- (b) if a beneficiary has committed in other EU or Euratom grants awarded to it under similar conditions systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (extension of findings from other grants to this grant; see Article 22.5.2), or
- (c) if the action is suspected of having lost its scientific or technological relevance.

49.2.2 Procedure

Before suspending implementation of the action, the Agency will formally notify the coordinator:

- informing it of its intention to suspend the implementation and the reasons why and
- inviting it to submit observations within 30 days of receiving notification.

If the *Agency* does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify **confirmation** of the suspension. Otherwise, it will formally notify that the procedure is not continued.

The suspension will **take effect** five days after confirmation notification is received by the coordinator (or on a later date specified in the notification).

It will be **lifted** if the conditions for resuming implementation of the action are met.

The coordinator will be formally notified of the lifting and the Agreement will be **amended** to set the date on which the action will be resumed, extend the duration of the action and make other changes necessary to adapt the action to the new situation (see Article 55) — unless the Agreement has already been terminated (see Article 50).

The suspension will be lifted with effect from the resumption date set out in the amendment. This date may be before the date on which the amendment enters into force.

Costs incurred during suspension are not eligible (see Article 6).

The beneficiaries may not claim damages due to suspension by the Agency (see Article 46).

Suspension of the action implementation does not affect the *Agency's* right to terminate the Agreement or participation of a beneficiary (see Article 50), reduce the grant or recover amounts unduly paid (see Articles 43 and 44).

ARTICLE 50 — TERMINATION OF THE AGREEMENT OR OF THE PARTICIPATION OF ONE OR MORE BENEFICIARIES

50.1 Termination of the Agreement by the beneficiaries

50.1.1 Conditions and procedure

The beneficiaries may terminate the Agreement.

The coordinator must formally notify termination to the Agency (see Article 52), stating:

- the reasons why and
- the date the termination will take effect. This date must be after the notification.

If no reasons are given or if the *Agency* considers the reasons do not justify termination, the Agreement will be considered to have been '**terminated improperly**'.

The termination will take effect on the day specified in the notification.

50.1.2 Effects

The coordinator must — within 60 days from when termination takes effect — submit:

- (i) a periodic report (for the open reporting period until termination; see Article 20.3) and
- (ii) the final report (see Article 20.4).

If the *Agency* does not receive the reports within the deadline (see above), only costs which are included in an approved periodic report will be taken into account.

The *Agency* will **calculate** the final grant amount (see Article 5.3) and the balance (see Article 21.4) on the basis of the reports submitted. Only costs incurred until termination are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.
Improper termination may lead to a reduction of the grant (see Article 43).

After termination, the beneficiaries' obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38 and 40) continue to apply.

50.2 Termination of the participation of one or more beneficiaries, by the beneficiaries

50.2.1 Conditions and procedure

The participation of one or more beneficiaries may be terminated by the coordinator, on request of the beneficiary concerned or on behalf of the other beneficiaries.

The coordinator must formally notify termination to the *Agency* (see Article 52) and inform the beneficiary concerned.

If the coordinator's participation is terminated without its agreement, the formal notification must be done by another beneficiary (acting on behalf of the other beneficiaries).

The notification must include:

- the reasons why;
- the opinion of the beneficiary concerned (or proof that this opinion has been requested in writing);
- the date the termination takes effect. This date must be after the notification, and
- a request for amendment (see Article 55), with a proposal for reallocation of the tasks and the estimated budget of the beneficiary concerned (see Annexes 1 and 2) and, if necessary, the addition of one or more new beneficiaries (see Article 56). If termination takes effect after the period set out in Article 3, no request for amendment must be included unless the beneficiary concerned is the coordinator. In this case, the request for amendment must propose a new coordinator.

If this information is not given or if the *Agency* considers that the reasons do not justify termination, the participation will be considered to have been **terminated improperly**.

The termination will **take effect** on the day specified in the notification.

50.2.2 Effects

The coordinator must — within 30 days from when termination takes effect — submit:

- (i) a report on the distribution of payments to the beneficiary concerned and
- (ii) if termination takes effect during the period set out in Article 3, a '**termination report**' from the beneficiary concerned, for the open reporting period until termination, containing an overview of the progress of the work, an overview of the use of resources, the individual financial statement and, if applicable, the certificate on the financial statement (see Articles 20.3 and 20.4).

The information in the termination report must also be included in the periodic report for the next reporting period (see Article 20.3).

If the request for amendment is rejected by the *Agency*, (because it calls into question the decision awarding the grant or breaches the principle of equal treatment of applicants), the Agreement may be terminated according to Article 50.3.1(c).

If the request for amendment is accepted by the *Agency*, the Agreement is **amended** to introduce the necessary changes (see Article 55).

The *Agency* will **calculate** — on the basis of the periodic reports, the termination report and the report on the distribution of payments — if the (pre-financing and interim) payments received by the beneficiary concerned exceed the beneficiary's EU contribution (calculated by applying the reimbursement rate(s) to the eligible costs declared by the beneficiary and approved by the *Agency*). Only costs incurred by the beneficiary concerned until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

- If the payments received **exceed the amounts due**:
 - if termination takes effect during the period set out in Article 3 and the request for amendment is accepted, the beneficiary concerned must repay to the coordinator the amount unduly received. The *Agency* will formally notify the amount unduly received and request the beneficiary concerned to repay it to the coordinator within 30 days of receiving notification. If it does not repay the coordinator, the *Agency* will draw upon the Guarantee Fund to pay the coordinator and then notify a **debit note** on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);
 - in all other cases (in particular if termination takes effect after the period set out in Article 3), the *Agency* will formally notify a **debit note** to the beneficiary concerned. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the *Agency* the amount due and the *Agency* will notify a debit note on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);
 - if the beneficiary concerned is the former coordinator, it must repay the new coordinator according to the procedure above, unless:
 - termination is after an interim payment and
 - the former coordinator has not distributed amounts received as pre-financing or interim payments (see Article 21.7).

In this case, the *Agency* will formally notify a **debit note** to the former coordinator. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the *Agency* the amount due. The *Agency* will then pay the new coordinator and notify a debit note on behalf of the Guarantee Fund to the former coordinator (see Article 44).

• If the payments received **do not exceed the amounts due**: amounts owed to the beneficiary concerned will be included in the next interim or final payment.

If the *Agency* does not receive the termination report within the deadline (see above), only costs included in an approved periodic report will be taken into account.

If the *Agency* does not receive the report on the distribution of payments within the deadline (see above), it will consider that:

- the coordinator did not distribute any payment to the beneficiary concerned and that
- the beneficiary concerned must not repay any amount to the coordinator.

Improper termination may lead to a reduction of the grant (see Article 43) or termination of the Agreement (see Article 50).

After termination, the concerned beneficiary's obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38 and 40) continue to apply.

50.3 Termination of the Agreement or the participation of one or more beneficiaries, by the *Agency*

50.3.1 Conditions

The Agency may terminate the Agreement or the participation of one or more beneficiaries, if:

- (a) one or more beneficiaries do not accede to the Agreement (see Article 56);
- (b) a change to their legal, financial, technical, organisational or ownership situation is likely to substantially affect or delay the implementation of the action or calls into question the decision to award the grant;
- (c) following termination of participation for one or more beneficiaries (see above), the necessary changes to the Agreement would call into question the decision awarding the grant or breach the principle of equal treatment of applicants (see Article 55);
- (d) implementation of the action is prevented by force majeure (see Article 51) or suspended by the coordinator (see Article 49.1) and either:
 - (i) resumption is impossible, or
 - (ii) the necessary changes to the Agreement would call into question the decision awarding the grant or breach the principle of equal treatment of applicants;
- (e) a beneficiary is declared bankrupt, being wound up, having its affairs administered by the courts, has entered into an arrangement with creditors, has suspended business activities, or is subject to any other similar proceedings or procedures under national law;
- (f) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has been found guilty of professional misconduct, proven by any means;
- (g) a beneficiary does not comply with the applicable national law on taxes and social security;
- (h) the action has lost scientific or technological relevance;
- (i) not applicable;
- (j) not applicable;

- (k) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed fraud, corruption, or is involved in a criminal organisation, money laundering or any other illegal activity affecting the EU's financial interests;
- (l) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has in the award procedure or under the Agreement committed:
 - (i) substantial errors, irregularities, fraud or
 - (ii) serious breach of obligations, including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles;
- (m) a beneficiary has committed in other EU or Euratom grants awarded to it under similar conditions systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant ('extension of findings from other grants to this grant').

50.3.2 Procedure

Before terminating the Agreement or participation of one or more beneficiaries, the *Agency* will formally notify the coordinator:

- informing it of its intention to terminate and the reasons why and
- inviting it, within 30 days of receiving notification, to submit observations and in case of Point (l.ii) above to inform the *Agency* of the measures to ensure compliance with the obligations under the Agreement.

If the *Agency* does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify to the coordinator **confirmation** of the termination and the date it will take effect. Otherwise, it will formally notify that the procedure is not continued.

The termination will **take effect**:

- for terminations under Points (b), (c), (e), (g), (h), (j), and (l.ii) above: on the day specified in the notification of the confirmation (see above);
- for terminations under Points (a), (d), (f), (i), (k), (l.i) and (m) above: on the day after the notification of the confirmation is received by the coordinator.

50.3.3 Effects

(a) for termination of the Agreement:

The coordinator must — within 60 days from when termination takes effect — submit:

- (i) a periodic report (for the last open reporting period until termination; see Article 20.3) and
- (ii) a final report (see Article 20.4).

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If the Agreement is terminated for breach of the obligation to submit the reports (see Articles 20.8 and 50.3.1(l)), the coordinator may not submit any reports after termination.

If the *Agency* does not receive the reports within the deadline (see above), only costs which are included in an approved periodic report will be taken into account.

The *Agency* will **calculate** the final grant amount (see Article 5.3) and the balance (see Article 21.4) on the basis of the reports submitted. Only costs incurred until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

This does not affect the *Agency's* right to reduce the grant (see Article 43) or to impose administrative and financial penalties (Article 45).

The beneficiaries may not claim damages due to termination by the Agency (see Article 46).

After termination, the beneficiaries' obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38 and 40) continue to apply.

(b) for termination of the participation of one or more beneficiaries:

The coordinator must — within 60 days from when termination takes effect — submit:

- (i) a report on the distribution of payments to the beneficiary concerned;
- (ii) a request for amendment (see Article 55), with a proposal for reallocation of the tasks and estimated budget of the beneficiary concerned (see Annexes 1 and 2) and, if necessary, the addition of one or more new beneficiaries (see Article 56). If termination is notified after the period set out in Article 3, no request for amendment must be submitted unless the beneficiary concerned is the coordinator. In this case the request for amendment must propose a new coordinator, and
- (iii) if termination takes effect during the period set out in Article 3, a **termination report** from the beneficiary concerned, for the open reporting period until termination, containing an overview of the progress of the work, an overview of the use of resources, the individual financial statement and, if applicable, the certificate on the financial statement (see Article 20).

The information in the termination report must also be included in the periodic report for the next reporting period (see Article 20.3).

If the request for amendment is rejected by the *Agency* (because it calls into question the decision awarding the grant or breaches the principle of equal treatment of applicants), the Agreement may be terminated according to Article 50.3.1(c).

If the request for amendment is accepted by the *Agency*, the Agreement is **amended** to introduce the necessary changes (see Article 55).

The *Agency* will **calculate** — on the basis of the periodic reports, the termination report and the report on the distribution of payments — if the (pre-financing and interim) payments received by the beneficiary concerned exceed the beneficiary's EU contribution (calculated by applying the reimbursement rate(s) to the eligible costs declared by the beneficiary and approved by the *Agency*). Only costs incurred by the beneficiary concerned until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

- If the payments received **exceed the amounts due**:
 - if termination takes effect during the period set out in Article 3 and the request for amendment is accepted, the beneficiary concerned must repay to the coordinator the amount unduly received. The *Agency* will formally notify the amount unduly received and request the beneficiary concerned to repay it to the coordinator within 30 days of receiving notification. If it does not repay the coordinator, the *Agency* will draw upon the Guarantee Fund to pay the coordinator and then notify a debit note on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);
 - in all other cases, in particular if termination takes effect after the period set out in Article 3, the *Agency* will formally notify a **debit note** to the beneficiary concerned. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the *Agency* the amount due and the *Agency* will notify a debit note on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);
 - if the beneficiary concerned is the former coordinator, it must repay the new coordinator the amount unduly received, unless:
 - termination takes effect after an interim payment and
 - the former coordinator has not distributed amounts received as pre-financing or interim payments (see Article 21.7)

In this case, the *Agency* will formally notify a **debit note** to the former coordinator. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the *Agency* the amount due. The *Agency* will then pay the new coordinator and notify a debit note on behalf of the Guarantee Fund to the former coordinator (see Article 44).

• If the payments received **do not exceed the amounts due**: amounts owed to the beneficiary concerned will be included in the next interim or final payment.

If the *Agency* does not receive the termination report within the deadline (see above), only costs included in an approved periodic report will be taken into account.

If the *Agency* does not receive the report on the distribution of payments within the deadline (see above), it will consider that:

- the coordinator did not distribute any payment to the beneficiary concerned, and that

- the beneficiary concerned must not repay any amount to the coordinator.

After termination, the concerned beneficiary's obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38 and 40) continue to apply.

SECTION 4 FORCE MAJEURE

ARTICLE 51 — FORCE MAJEURE

'Force majeure' means any situation or event that:

- prevents either party from fulfilling their obligations under the Agreement,
- was unforeseeable, exceptional situation and beyond the parties' control,
- was not due to error or negligence on their part (or on the part of third parties involved in the action), and
- proves to be inevitable in spite of exercising all due diligence.

The following cannot be invoked as force majeure:

- any default of a service, defect in equipment or material or delays in making them available, unless they stem directly from a relevant case of force majeure,
- labour disputes or strikes, or
- financial difficulties.

Any situation constituting force majeure must be formally notified to the other party without delay, stating the nature, likely duration and foreseeable effects.

The parties must immediately take all the necessary steps to limit any damage due to force majeure and do their best to resume implementation of the action as soon as possible.

The party prevented by force majeure from fulfilling its obligations under the Agreement cannot be considered in breach of them.

CHAPTER 7 FINAL PROVISIONS

ARTICLE 52 — COMMUNICATION BETWEEN THE PARTIES

52.1 Form and means of communication

Communication under the Agreement (information, requests, submissions, 'formal notifications', etc.) must:

- be made in writing and

- bear the number of the Agreement.

Until the payment of the balance: all communication must be made through the electronic exchange system and using the forms and templates provided there.

After the payment of the balance: formal notifications must be made by registered post with proof of delivery ('formal notification on paper').

Communications in the electronic exchange system must be made by persons authorised according to the 'Terms and Conditions of Use of the electronic exchange system'. For naming the authorised persons, each beneficiary must have designated — before the signature of this Agreement — a 'Legal Entity Appointed Representative (LEAR)'. The role and tasks of the LEAR are stipulated in his/her appointment letter (see Terms and Conditions of Use of the electronic exchange system).

If the electronic exchange system is temporarily unavailable, instructions will be given on the *Agency and* Commission websites.

52.2 Date of communication

Communications are considered to have been made when they are sent by the sending party (i.e. on the date and time they are sent through the electronic exchange system).

Formal notifications through the **electronic** exchange system are considered to have been made when they are received by the receiving party (i.e. on the date and time of acceptance by the receiving party, as indicated by the time stamp). A formal notification that has not been accepted within 10 days after sending is considered to have been accepted.

Formal notifications **on paper** sent by **registered post** with proof of delivery (only after the payment of the balance) are considered to have been made on either:

- the delivery date registered by the postal service or
- the deadline for collection at the post office.

If the electronic exchange system is temporarily unavailable, the sending party cannot be considered in breach of its obligation to send a communication within a specified deadline.

52.3 Addresses for communication

The electronic exchange system must be accessed via the following URL:

https://ec.europa.eu/research/participants/portal/desktop/en/projects/

The Agency will formally notify the coordinator and beneficiaries in advance any changes to this URL.

Formal notifications on paper (only after the payment of the balance) addressed **to the** *Agency* must be sent to the following address:

Innovation and Networks Executive Agency ENERGY RESEARCH W910 - 03/023 B-1049 Brussels Belgium Formal notifications on paper (only after the payment of the balance) addressed **to the beneficiaries** must be sent to their legal address as specified in the 'Beneficiary Register'.

ARTICLE 53 — INTERPRETATION OF THE AGREEMENT

53.1 Precedence of the Terms and Conditions over the Annexes

The provisions in the Terms and Conditions of the Agreement take precedence over its Annexes.

Annex 2 takes precedence over Annex 1.

53.2 Privileges and immunities

Not applicable

ARTICLE 54 — CALCULATION OF PERIODS, DATES AND DEADLINES

In accordance with Regulation No $1182/71^{28}$, periods expressed in days, months or years are calculated from the moment the triggering event occurs.

The day during which that event occurs is not considered as falling within the period.

ARTICLE 55 — AMENDMENTS TO THE AGREEMENT

55.1 Conditions

The Agreement may be amended, unless the amendment entails changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

Amendments may be requested by any of the parties.

55.2 Procedure

The party requesting an amendment must submit a request for amendment signed in the electronic exchange system (see Article 52).

The coordinator submits and receives requests for amendment on behalf of the beneficiaries (see Annex 3).

If a change of coordinator is requested without its agreement, the submission must be done by another beneficiary (acting on behalf of the other beneficiaries).

The request for amendment must include:

- the reasons why;
- the appropriate supporting documents;

²⁸ Regulation (EEC, Euratom) No 1182/71 of the Council of 3 June 1971 determining the rules applicable to periods, dates and time-limits (OJ L 124, 8.6.1971, p. 1).

- for a change of coordinator without its agreement: the opinion of the coordinator (or proof that this opinion has been requested in writing).

The Agency may request additional information.

If the party receiving the request agrees, it must sign the amendment in the electronic exchange system within 45 days of receiving notification (or any additional information the *Agency* has requested). If it does not agree, it must formally notify its disagreement within the same deadline. The deadline may be extended, if necessary for the assessment of the request. If no notification is received within the deadline, the request is considered to have been rejected

An amendment enters into force on the day of the signature of the receiving party.

An amendment **takes effect** on the date agreed by the parties or, in the absence of such an agreement, on the date on which the amendment enters into force.

ARTICLE 56 — ACCESSION TO THE AGREEMENT

56.1 Accession of the beneficiaries mentioned in the Preamble

The other beneficiaries must accede to the Agreement by signing the Accession Form (see Annex 3) in the electronic exchange system (see Article 52) within 30 days after its entry into force (see Article 58).

They will assume the rights and obligations under the Agreement with effect from the date of its entry into force (see Article 58).

If a beneficiary does not accede to the Agreement within the above deadline, the coordinator must — within 30 days — request an amendment to make any changes necessary to ensure proper implementation of the action. This does not affect the *Agency's* right to terminate the Agreement (see Article 50).

56.2 Addition of new beneficiaries

In justified cases, the beneficiaries may request the addition of a new beneficiary.

For this purpose, the coordinator must submit a request for amendment in accordance with Article 55. It must include an Accession Form (see Annex 3) signed by the new beneficiary in the electronic exchange system (see Article 52).

New beneficiaries must assume the rights and obligations under the Agreement with effect from the date of their accession specified in the Accession Form (see Annex 3).

ARTICLE 57 — APPLICABLE LAW AND SETTLEMENT OF DISPUTES

57.1 Applicable law

The Agreement is governed by the applicable EU law, supplemented if necessary by the law of Belgium.

57.2 Dispute settlement

If a dispute concerning the interpretation, application or validity of the Agreement cannot be settled amicably, the General Court — or, on appeal, the Court of Justice of the European Union — has sole jurisdiction. Such actions must be brought under Article 272 of the Treaty on the Functioning of the EU (TFEU).

If a dispute concerns administrative or financial penalties, offsetting or an enforceable decision under Article 299 TFEU (see Articles 44, 45 and 46), the beneficiaries must bring action before the General Court — or, on appeal, the Court of Justice of the European Union — under Article 263 TFEU. *Actions against enforceable decisions must be brought against the Commission (not against the Agency).*

ARTICLE 58 — ENTRY INTO FORCE OF THE AGREEMENT

The Agreement will enter into force on the day of signature by the *Agency* or the coordinator, depending on which is later.

SIGNATURES

For the coordinator

For the *Agency*

Paula VERHOEVEN with ECAS id nvhoevpa signed in the Participant Portal on 17/10/2016 at 09:59:01 (transaction id Sigld-9640-LpMDsXJ6NBblbuv5HvAyXff8t2ImC9AZedGtRMzOavqLZhJ7Pcyq21R B6gIUkA8inDnrJzTcIVZX4JfWivzkG-PHsIUMVSXYCWl6qOJrH748-P5mW6lo6uoOPeb7aveiBfeop36HNIZ0wB55P1cR6P9K). Timestamp by third party at Mon Oct 17 10:59:13 CEST 2016

Signed by Alan HAIGH with ECAS id haigala as an authorised representative on 26-10-2016 11:05:13 (transaction id Sigld-55774-1jqDbG2wvA14JihoWquIW5bjzdgZIR0Iq40uWrLycMRPILC5y0UztK SOxwXI3bzd91j3kPEWSHyxU5iJbQiVzzI-Jj71zxYb8yrkmoAceBIUCa-IgIVXWy2snH7yfqQxKGVKWIUciZFO5zuh4RQOgUwyYd) Wed Oct 26 11:05:22 CEST 2016





EUROPEAN COMMISSION Innovation and Networks Executive Agency ENERGY RESEARCH



ANNEX 1 (part A)

Innovation action

NUMBER — 731198 — Ruggedised

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1.1. The project summary

Project Number ¹	731198	Project Acronym ²	Ruggedised						
	One form per project								
		General inform	ation						
Project title ³ Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment									
Starting date ⁴	01/11/20	116							
Duration in months ⁵	uration in months ⁵ 60								
Call (part) identifier ⁶	H2020-S	SCC-2016							
Торіс	SCC-1-2 Smart Ci	016-2017 ities and Communities ligh	thouse projects						
Fixed EC Keywords	Renewat wireless	ble energy sources - genera energy transfer, Sustainabl	l, Energy systems, smart energy, smart grids, e energy communities						
Free keywords internet of things, clean energy, smart electro-mobility, smart tools and services, innovative solutions, economic viability, buildings, energy systems, climate change, waste, air quality									
		Abstract ⁷							

The RUGGEDISED project will create urban spaces powered by secure, affordable and clean energy, smart electromobility, smart tools and services. The overall aims are:

1. Improving the quality of life of the citizens, by offering the citizens a clean, safe, attractive, inclusive and affordable living environment.

2. Reducing the environmental impacts of activities, by achieving a significant reduction of CO2 emissions, a major increase in the investment and usage of RES and an increase in the deployment of electric vehicles.

3. Creating a stimulating environment for sustainable economic development, by generating more sustainable jobs, stimulating community involvement in smart solutions and to boost start-up and existing companies to exploit the opportunities of the green digital economy and Internet of Things.

To achieve the aims, a key innovation challenge in all three lighthouse cities of RUGGEDISED is to arrange successful combinations of integrated smart solutions for energy and e-mobility (enabled by ICT platforms and open data protocols) and business models with the right incentives for stakeholders to invest and participate in a smart society. Specific challenges relevant for the lighthouse cities are:

- to manage peak load variation in thermal and electrical energy supply and demand;

- to develop appropriate cooperation structures and business models for exchange of energy;

- to develop Smart City (open) data platforms and energy management systems

RUGGEDISED has derived 10 specific objectives and planned 32 smart solutions to meet the challenges. The development of solutions in the lighthouse cities is not the primary goal of the project, but a necessary means to find the right incentives and to create validated business cases to enable large scale deployment and replication of solutions. Three follower cities Brno, Parma and Gdansk have selected 27 smart follower solutions to follow the lighthouse cities and to prepare for implementation in the future

1.2. List of Beneficiaries

Proje	Project Number ¹ 731198 Project Acronym ² Ruggedised									
	List of Beneficiaries									
No	Name			Short name		Country	Project entry month ⁸	Project exit month		
1	GEMEENTE R	OTTERDAM		ROT]	Netherlands	1	60		
2	UMEA KOMM	UN		UME	1	Sweden	1	60		
3	GLASGOW CI	TY COUNCIL		GCC	1	United Kingdom	1	60		
4	SP SVERIGES FORSKNINGS	TEKNISKA INSTITUT AB		SP	1	Sweden	1	60		
5	ISTITUTO DI S L'INTEGRAZIO	STUDI PER ONE DEI SISTEMI SC		ISINNOVA]	Italy	1	60		
6	AIT AUSTRIA TECHNOLOGY	N INSTITUTE OF Y GMBH		AIT		Austria	1	60		
7	NEDERLANDS VOOR TOEGE NATUURWETI ONDERZOEK	SE ORGANISATIE PAST ENSCHAPPELIJK TNO		TNO]	Netherlands	1	60		
8	ICLEI EUROPEAN SECRETARIAT GMBH (ICLEI EUROPASEKRETARIAT GMBH)*		MBH 5H)*	ICLEI		Germany	1	60		
9	ERASMUS UN	IVERSITEIT ROTTER	DAM	EUR]	Netherlands	1	60		
10	UMEA UNIVE	RSITET		UU	1	Sweden	1	60		
11	UNIVERSITY	OF STRATHCLYDE		US United Kingdor		United Kingdom	1	60		
12	VYSOKE UCE	NI TECHNICKE V BRI	NE	UB Cz		Czech Republic	1	60		
13	STATUTARNI	MESTO BRNO		Brno	(Czech Republic	1	60		
14	COMUNE DI P	ARMA		Parma]	Italy	1	60		
15	URZAD MIEJS	KI W GDANSKU		Gdansk]	Poland	1	60		
16	Ballast Nedam I Holding B.V.	Bouw & Ontwikkeling		BN]	Netherlands	1	60		
17	ROTTERDAMS NV	SE ELEKTRISCHE TRA	AM	RET]	Netherlands	1	60		
18	ENECO ZAKE	LIJK BV		ENE]	Netherlands	1	60		
19	Koninklijke KP	N NV		KPN]	Netherlands	1	60		
20	AKADEMISKA	A HUS AKTIEBOLAG		AHAB	5	Sweden	1	60		
21	VASTERBOTT	ENS LANS LANDSTIN	IG	VCC	5	Sweden	1	60		
22	UMEA ENERG	I AKTIEBOLAG		UEAB	5	Sweden	1	60		
23	UMEA PARKE	RINGS AKTIEBOLAG		UPAB	5	Sweden	1	60		
24	SCOTTISH GO	VERNMENT		TS	1	United Kingdom	1	60		
25	SP POWER SY	STEMS LIMITED		SPPS	1	United Kingdom	1	60		
26	TENNENT CA UK LIMITED	LEDONIAN BREWERI	ES	ТСВ	1	United Kingdom	1	60		

1.2. List of Beneficiaries

No	Name	Short name	Country	Project entry month ⁸	Project exit month
27	SIEMENS PUBLIC LIMITED COMPANY	SIE	United Kingdom	1	60
28	PICTEC	PIC	Poland	1	60
29	UNIRESEARCH BV	UNR	Netherlands	1	60
30	INFOMOBILITY SPA	INF	Italy	1	60
31	FUTURE INSIGHT GROUP BV	FI	Netherlands	1	60
32	THE GLASGOW HOUSING ASSOCIATION LIMITED IPS	WG	United Kingdom	1	60
33	GDANSKA INFRASTRUCTURA WODOCIAGOWO-KANALIZACYJNA SP ZOO	GIWK	Poland	1	60
34	ACREO SWEDISH ICT AB	SI	Sweden	1	60

1.3. Workplan Tables - Detailed implementation

1.3.1. WT1 List of work packages

WP Number ⁹	WP Title	Lead beneficiary ¹⁰	Person- months ¹¹	Start month ¹²	End month ¹³
WP1	Cross-city Implementation and Innovation in the Lighthouses	7 - TNO	102.00	1	40
WP2	Challenges and Solutions Rotterdam	1 - ROT	255.00	1	60
WP3	Challenges and Solutions in Umeå	2 - UME	207.00	1	60
WP4	Challenges and Solutions in Glasgow	3 - GCC	163.50	1	60
WP5	Monitoring and Evaluation	6 - AIT	125.50	1	60
WP6	Enabling upscaled deployment and business model innovation	4 - SP	124.50	9	60
WP7	Replication to Follower cities and Knowledge transfer	5 - ISINNOVA	265.50	7	60
WP8	Interaction with other Smart City projects	1 - ROT	31.00	1	60
WP9	Communication and Dissemination	8 - ICLEI	136.40	1	60
WP10	Project Management	1 - ROT	108.00	1	60
WP11	Ethics requirements	1 - ROT	N/A	1	60
	·	Total	1,518.40		

Deliverable Number ¹⁴	Deliverable Title	WP number ⁹	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D1.1	"Lessons learned on the implementation of smart solutions in the Lighthouses", interim report 1/3	WP1	7 - TNO	Report	Public	16
D1.2	Overarching innovation and implementation framework	WP1	7 - TNO	Report	Public	6
D1.3	"Lessons learned on the implementation of smart solutions in the Lighthouses", interim report 2/3	WP1	7 - TNO	Report	Public	28
D1.4	Guide for setting up and sustaining Local Innovation Platforms	WP1	4 - SP	Report	Public	30
D1.5	Prototype Smart Energy District planner	WP1	7 - TNO	Report	Public	40
D1.6	Guidance on Smart City Design and Decision Platform	WP1	1 - ROT	Report	Public	40
D1.7	"Lessons learned on the implementation of smart solutions in the Lighthouses", final report 3/3	WP1	7 - TNO	Report	Public	40
D1.8	Guide on ruggedized implementation and innovation of smart solutions	WP1	11 - US	Report	Public	40
D2.1	Data privacy report of the 3-D model	WP2	31 - FI	Report	Public	24
D2.2	Report on implementation LoRa- network on low cost new sensors techniques for HoS area	WP2	19 - KPN	Report	Public	12
D2.3	Introduction first six zero emission e-buses	WP2	17 - RET	Other	Public	24
D2.4	Implementation of efficient and intelligent street lighting in HoS (adjustable intensity to real time needs)	WP2	1 - ROT	Other	Public	30
D2.5	Sensors to measure filling of waste	WP2	1 - ROT	Other	Public	30

1.3.2. WT2 list of deliverables

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Deliverable Number ¹⁴	Deliverable Title	WP number ⁹	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
	containers implemented (Smart waste management)					
D2.6	Implementation Report Rotterdam (1/3)	WP2	1 - ROT	Report	Public	36
D2.7	Guidelines ready for share of data between buildings related to Energy Management optimalisation	WP2	1 - ROT	Report	Public	42
D2.8	Plan for re-use of waste streams to produce thermal energy	WP2	16 - BN	Report	Public	46
D2.9	Plan for balancing geothermal heat-cold storage system by using surface water	WP2	16 - BN	Report	Public	48
D2.10	Plan for balancing geothermal heat-cold storage system by using heat exchanger under pavement/road	WP2	16 - BN	Report	Public	50
D2.11	Report on PV panels implemented near bus station for battery storage	WP2	18 - ENE	Report	Public	46
D2.12	Report on new parking lots implemented for Smart charging	WP2	18 - ENE	Report	Public	48
D2.13	Report on thermal distribution system built for exchange system based on low- temperature thermal grid	WP2	16 - BN	Report	Public	48
D2.14	Report on feasibility study for implementation first pilot "Nerdalize"	WP2	18 - ENE	Report	Public	48
D2.15	Implementation Report Rotterdam (2/3)	WP2	1 - ROT	Report	Public	48
D2.16	Implementation Report Rotterdam (3/3)	WP2	1 - ROT	Report	Public	60
D3.1	Business Model proving investments on sustainable mobility solutions (reduce parking spaces to	WP3	23 - UPAB	Report	Confidential, only for members of the consortium (including the	30

Deliverable Number ¹⁴	Deliverable Title	WP number ⁹	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
	stimulate e-car sharing, e-buses, e-cycling)(1/2)				Commission Services)	
D3.2	Business Model proving connection to 100% renewable energy	WP3	22 - UEAB	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D3.3	Business Model proving sharing of geothermal heating/ cooling storage	WP3	21 - VCC	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D3.4	Implementation Report Umeå (1/3)	WP3	2 - UME	Report	Public	36
D3.5	City Decision Support platform ready	WP3	2 - UME	Other	Public	40
D3.6	Automatic smart control units (for room climate and lighting) installed in approx. 130 offices	WP3	20 - AHAB	Other	Public	40
D3.7	Web based information platform for energy management	WP3	22 - UEAB	Other	Public	40
D3.8	Concept "Bus rapid transit station" installed in campus area (New shelter, heating systems, intelligent tickets identification)	WP3	2 - UME	Other	Public	42
D3.9	E-charging facilities for e-vehicles installed in Umeå	WP3	20 - AHAB	Other	Public	42
D3.10	Analysis tools on energy consumption implemented on campus (to support demand-side management)	WP3	10 - UU	Other	Public	42
D3.11	Implementation Report Umeå (2/3)	WP3	2 - UME	Report	Public	48
D3.12	Implementation Report Umeå (3/3)	WP3	2 - UME	Report	Public	60
D4.1	Business Model allowing buildings selling heat (to each	WP4	3 - GCC	Report	Confidential, only for members of the consortium	12

Deliverable Number ¹⁴	Deliverable Title	WP number ⁹	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
	other and to local housing)				(including the Commission Services)	
D4.2	Business Model allowing use of battery storage as grid balancing mechanism	WP4	27 - SIE	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D4.3	Business Case allowing power transfer from CHP to battery	WP4	3 - GCC	Report	Public	36
D4.4	Plan ready for innovative renewable installation (netting off energy generation against consumption)	WP4	3 - GCC	Report	Public	36
D4.5	Decision support Platform (ICT solution) for informing strategy and decision making	WP4	3 - GCC	Other	Public	36
D4.6	Implementation Report Glasgow (1/3)	WP4	3 - GCC	Report	Public	36
D4.7	Deployment of EV chargers in city centre car park	WP4	3 - GCC	Other	Public	40
D4.8	Street lights (300) replaced by intelligent LED columns	WP4	3 - GCC	Other	Public	40
D4.9	Implemented Management system to integrate domestic properties into a 'smart grid'	WP4	27 - SIE	Other	Public	42
D4.10	Implemented Management system to integrate non-domestic properties into a 'smart grid'	WP4	27 - SIE	Other	Public	42
D4.11	Analysis tools on LED street lighting implemented (to support demand-side management)	WP4	27 - SIE	Other	Public	48
D4.12	Implementation Report Glasgow (2/3)	WP4	3 - GCC	Report	Public	48

Deliverable Number ¹⁴	Deliverable Title	WP number ⁹	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D4.13	Implementation Report Glasgow (3/3)	WP4	3 - GCC	Report	Public	60
D5.1	Monitoring and evaluation manual	WP5	6 - AIT	Report	Public	12
D5.2	Evaluation templates	WP5	6 - AIT	Report	Public	12
D5.3	Maintenance plan	WP5	6 - AIT	Other	Confidential, only for members of the consortium (including the Commission Services)	18
D5.4	Monitoring Documentation	WP5	6 - AIT	Report	Confidential, only for members of the consortium (including the Commission Services)	60
D5.5	Assessment of light house projects (interim report ready at M48)	WP5	6 - AIT	Report	Public	60
D5.6	Analysis of alignment with City strategies	WP5	7 - TNO	Report	Public	60
D5.7	Monitoring report on measures to maximize the impact	WP5	5 - ISINNOVA	Report	Public	60
D6.1	Initial findings from the establishment of Innovation Platforms	WP6	4 - SP	Report	Public	18
D6.2	"Rich narratives" – Scenario analyses for the Lighthouse cities and recommendations	WP6	4 - SP	Report	Public	18
D6.3	Report on the Context and Critical Conditions (CCC) process and result for each light house city	WP6	4 - SP	Report	Public	26
D6.4	Summary of energy systems analysis report –conclusions from simulation for the three Lighthouse cities	WP6	4 - SP	Report	Public	30
D6.5	Plans for integration of Innovation Platforms into local innovation processes	WP6	4 - SP	Report	Public	30

Deliverable Number ¹⁴	Deliverable Title	WP number ⁹	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D6.6	Business Models for Smart Cities- Cities – conclusions on methods for generating bankable smart solutions	WP6	9 - EUR	Report	Public	48
D6.7	Innovation Platforms for Innovative cities –conclusions and recommendations	WP6	4 - SP	Report	Public	58
D7.1	Initial Replication Assessments	WP7	5 - ISINNOVA	Report	Public	19
D7.2	Visions and Roadmaps	WP7	5 - ISINNOVA	Report	Public	39
D7.3	Intermediate Replication Assessments	WP7	5 - ISINNOVA	Report	Public	44
D7.4	Replication and Investment Plans	WP7	5 - ISINNOVA	Report	Public	59
D7.5	Reports from the Governing Groups meetings	WP7	5 - ISINNOVA	Report	Confidential, only for members of the consortium (including the Commission Services)	53
D7.6	Reports from the technical workshops	WP7	5 - ISINNOVA	Report	Confidential, only for members of the consortium (including the Commission Services)	57
D7.7	Lessons learned on replication for wide uptake	WP7	5 - ISINNOVA	Report	Public	60
D8.1	First version SCC1 Database (combined calendar, dissemination material, useful links) One per task!	WP8	8 - ICLEI	Other	Public	18
D8.2	Report from the Liaison groups on implementation needs	WP8	29 - UNR	Report	Public	48
D8.3	Report on project contribution to the SCC1 initiative	WP8	5 - ISINNOVA	Report	Public	48
D9.1	Communications & Dissemination Strategy	WP9	8 - ICLEI	Other	Public	3
D9.2	Local communication strategy	WP9	8 - ICLEI	Other	Public	3

Deliverable Number ¹⁴	Deliverable Title	WP number ⁹	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D9.3	Corporate design (logos, templates & branding guide)	WP9	8 - ICLEI	Other	Public	5
D9.4	Project website	WP9	8 - ICLEI	Other	Public	6
D9.5	E-update	WP9	8 - ICLEI	Other	Public	8
D9.6	Promotional brochure	WP9	8 - ICLEI	Other	Public	8
D9.7	European workshop 1/5	WP9	8 - ICLEI	Other	Public	10
D9.8	Study visit in Lighthouse City, including one national/ regional showcase event per Lighthouse City 1/3	WP9	8 - ICLEI	Other	Public	16
D9.9	European workshop 2/5	WP9	8 - ICLEI	Other	Public	22
D9.10	Article in media 1/3	WP9	8 - ICLEI	Other	Public	24
D9.11	Smart Cities Technical Factsheets	WP9	8 - ICLEI	Other	Public	24
D9.12	Study visit in Lighthouse City, including one national/ regional showcase event per Lighthouse City 2/3	WP9	8 - ICLEI	Other	Public	30
D9.13	European workshop 3/5	WP9	8 - ICLEI	Other	Public	34
D9.14	Article in media 2/3	WP9	8 - ICLEI	Other	Public	36
D9.15	Smart Cities Thematic Factsheets	WP9	8 - ICLEI	Other	Public	42
D9.16	Study visit in Lighthouse City, including one national/ regional showcase event per Lighthouse City 3/3	WP9	8 - ICLEI	Other	Public	44
D9.17	European workshop 4/5	WP9	8 - ICLEI	Other	Public	46
D9.18	Article in media 3/3	WP9	8 - ICLEI	Other	Public	48
D9.19	European workshop 5/5	WP9	8 - ICLEI	Other	Public	58
D9.20	Project Results Brochure	WP9	8 - ICLEI	Other	Public	58
D9.21	Data Management Plan	WP9	8 - ICLEI	ORDP: Open Research Data Pilot	Public	6
D10.1	Quality assurance and Risk Management plan	WP10	6 - AIT	Report	Confidential, only for members	6

Deliverable Number ¹⁴	Deliverable Title	WP number ⁹	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
					of the consortium (including the Commission Services)	
D11.1	POPD - Requirement No. 1	WP11	1 - ROT	Ethics	Confidential, only for members of the consortium (including the Commission Services)	6
D11.2	EPQ - Requirement No. 2	WP11	1 - ROT	Ethics	Confidential, only for members of the consortium (including the Commission Services)	1

1.3.3. WT3 Work package descriptions

Work package number ⁹	WP1	Lead beneficiary ¹⁰	7 - TNO
Work package title	Cross-city Im	plementation and Innovation in	n the Lighthouses
Start month	1	End month	40

Objectives

The overall objective of this work package is to guide, coordinate and facilitate the implementation of smart solutions in the three lighthouse cities, to support the Lighthouse cities with knowledge and processes to maximize the impact of the measures. With this objective the coherency of the implementation of smart solutions will be secured, thereby maximising their impacts and ensuring that lessons learned will be extracted and condensed in an easy to use manner for follower cities and for other EU-cities.

The sub-objectives of this work package are to:

- Develop an overarching innovation and implementation framework to guide and coordinate the implementation of the smart solutions on Energy and E-mobility, ICT, and Innovation and new business models in the Lighthouse cities;

- Sustain coordination and enhance coherency of implementation (of smart solutions) among the lighthouse cities by ensuring that relevant knowledge and experiences are shared in a facilitated fashion, which allows for extracting relevant lessons learned;

- Develop tools and guidance for decision support and implementation of smart solutions in follower cites, and other EU-cities, based on lessons learned.

Description of work and role of partners

WP1 - Cross-city Implementation and Innovation in the Lighthouses [Months: 1-40] **TNO**, ROT, UME, GCC, SP, ISINNOVA, AIT, ICLEI, EUR, US

Task 1.1 – Preparing the ground for innovation and implementation of measures in the lighthouse cities M1-6 (Lead TNO; Partners: ROT, UME, GCC, SP, EUR, US, ISINNOVA, AIT)

In each of the lighthouse cities measures will be taken on energy and E-mobility, which will require further system integration, energy storage, conversion and energy saving, etc. to reach the energy and CO2 reduction targets. These measures will be supported and managed by ICT applications and facilitated by innovative business models and local innovation platforms. These three types of measures that can be called "hardware", software and orgware", together form an integrated mix of measures to reach energy and CO2 reduction.

Smart City Measures on:

- Hardware: Energy and E-mobility

- Software: ICT applications, management

- Orgware: Innovation, new business models, governance,

The three lighthouse cities will be supported from Task 1.2 -whilst taking these measures- by latest insights and knowledge on: energy saving, energy system integration, energy storage and conversion, e-mobility, privacy issues of ICT, Internet of Things, governance, functioning of local innovation ecosystems, business modelling, etc. To ensure that measures will be implemented in a coherent way among the lighthouse cities, regular workshops will be organised with representatives from the three lighthouse and, where possible, from the follower cities. In Task 1.1 these activities will be prepared in several ways.

ST1.1.1 Overarching innovation and implementation framework

An overarching innovation and implementation framework will be developed that contains the main technical and socio-economic challenges and contextual factors that influence (hampers or enforces) local innovation and the implementation of smart solutions in each of the lighthouse cities. The framework will be based on interviews with implementation practitioners from the lighthouse cities and on relevant theoretical considerations from literature on innovation, implementation and governance. This work, executed together with the lighthouse cities, will single out specific interest areas where the lighthouse cities require expert support and/or cross-city knowledge transfer. These areas will include technical issues, managerial matters, cross-sectorial coordination, innovation and governance, new business models, and community involvement issues. In this task the Lighthouses, their knowledge and innovation

support organisations (SP for Umeå, University of Strathclyde for Glasgow, TNO for Rotterdam), Erasmus University for business modelling, and the leads of WP5, 6, and 7 (AIT, SP, and ISINNOVA), are involved in preparing this framework. The framework will highlight specific topics for the cities that are important across the lighthouses and follower cities. Furthermore, this task will deliver specific topics that are relevant to be monitored and a strong coordination with T5.1 will be set up. The framework will feed into the agenda of the workshops of T1.2 and will act also as a theoretical background for the discussions. The framework will be discussed in the beginning of the project through a dedicated session that will be organised during the Kick-off meeting.

ST1.1.2 Setting up of Lighthouse City "Thematic Liaison Groups"

Three "Thematic Liaison Groups" for the "hardware", "software" and "orgware" measures will be set up with representatives from each light house, bringing together people with the same tasks and interests (for instance energy experts from Umeå, Rotterdam and Glasgow). The specific measures that will be taken (the smart solutions) in the Lighthouse districts will be listed together with the people that are responsible for preparing and implementing them. This will result in an extensive list of measures and responsible people that is available for the consortium. From this list a smaller list of members of the three liaison groups will be recruited in consultation with the Lighthouse cities. These lists will be available for the consortium members.

This task will deliver a public report on the innovation and implementation framework.

Task 1.2 – Supporting and coordinating the implementation of the smart solutions

M1-38 (Lead TNO; Partners: ROT, UME, GCC, SP,US, ISINNOVA, AIT, ICLEI, EUR)

This task is specifically dedicated towards implementation, innovation and learning across the cities. To ensure that the teams in the lighthouse cities that are involved in the design and implementation of the smart solutions do not work in isolation, this task will provide them with a seamless knowledge brokerage service to transfer and translate state-of-theart knowledge and to engage peers in the other lighthouse cities, including those working in the follower cities. Based on the preparatory work of T1.1 topics of particular interest for the Liaison Groups will be selected, and programmed to accordingly organise ad-hoc webinars and meetings in regular workshops.

The monitoring outputs from WP5 will contain valuable information to feed the discussion on the progress of the implementation in the three Liaison Groups. Vice versa will the outcome of these discussions help the interpretation of the monitoring data for WP 5, as it will serve as a "reality check".

Although the agenda for the liaison groups will be filled specifically in T1.1, we already foresee that the following topics will be addressed per liaison group.

The Smart Energy and E-mobility Liaison group will discuss:

- the implementation and impacts of the smart energy measures, including e-mobility

- monitoring results on energy and e-mobility

- the integration into the local energy system and choices related to that,

- possible barriers and solutions

The ICT Liaison group will discuss:

- the management options for the energy and e-mobility system,

- monitoring results on ICT-solutions

- data protocols, interoperability of the Smart City Design and Decision Platform, privacy issues,

- issues related to data upscaling from building to district and GIS-level

- openness versus partly closedness of the Platform related to privacy issues; level of detail of the open data related to privacy issues;

- progress on the Smart City Design and Decision Platform, barriers, and solutions

The Innovation and Business modelling Liaison Group will discuss:

- the progress in the Local Innovation Platforms in the Lighthouse Cities and issues raised there;
- monitoring results on innovation and business modelling
- multi-actor financial arrangements;
- new innovative business models;
- busines structures and financing;
- opportunities for local entrepreneurs and new jobs.

The chairs of the Liaison Groups will be selected (by voting or volunteer basis if approved) among the Lighthouse members of the specific groups. TNO will coordinate the preparation and follow-up of the meetings.

The Liaison Groups will meet twice a year. Each Topical Liaison Group will sit together once a year to discuss the above issues. Furthermore, every year all Liaison Groups will meet in integrated sessions, in order to keep the connection between the three topics that are interrelated.

Support to the Liaison Groups will come in different forms:

Phone or video conferences as well as email or social media deemed useful by the practitioners will be used to provide personal or multi-lateral support on specific issues, and to circulate relevant material for those interested in furthering specific topics. This will also include webinars for dedicated expert advice or virtual roundtables that will be supported by WP9 (T9.6). Regular workshops (2 times a year) with the Liaison Groups of the lighthouse cities to discuss the progress and the monitoring results, co-create knowledge and exchange experiences relevant for implementation of smart solutions. Where possible, these meetings will be organised back to back to other project meetings, like the General Assemblies. In these 2-day workshops the progress and bottlenecks of the implementation of the smart solutions in the lighthouses will be discussed, and lessons learned will be extracted. Liaison Groups will discuss topical issues (see above). To draw integrated lessons all Liaison groups will sit together once a year. The follower cities will be invited to these three integration meetings, facilitated from WP7.

Notes from the above meetings will be published in the blog updates in collaboration with WP 9 (T9.4).

The lessons learned from the in-depth exchange of experiences and knowledge across the Lighthouses will be captured and further developed into tools and guidance for implementation of smart solutions (see Task 1.3).

Task 1.3 – Prototype tools and guidance for decision support and implementation of smart solutions M12-40 (Lead TNO; Partners: ROT, UME, GCC, SP, US, ISINNOVA)

The lessons learned in the liaison groups will be summarised and materialised in prototype tools and guidance that will support future decisions and implementation of smart solutions in the follower and other EU-cities. The prototype tools and guidance will be tested in the Follower Cities (WP7) and after adaption to these experiences made available for a wide public of implementers and decision makers in EU-cities.

Each Liaison Group will produce a specific tool or guidance as output.

Lessons learned from the Smart Energy and E-mobility Liaison group will be used to produce the prototype smart energy district planner. The smart energy district planner is a tool that supports decisions on measures to better integrate and optimize the local energy system to reach low carbon output. It will contain information on measures to be taken, dilemmas for integration of the energy system in relation to path dependency (how to realise a resilient local energy system that is still open enough for future adaption to new energy options?), barriers to overcome (institutional, regulatory, financial, etc.) and how to recognise, involve and cooperate with important actors for the local energy system. It contains both quantitative and qualitative information relevant for system optimization, and furthermore, a flow chart, information on actors and interdependencies, bottlenecks and solutions, and will support better decisions on energy systems integration. This specific task is led by TNO. The prototype will be tested by the follower cities in WP7, adapted according to their experiences and then made available to other EU-cities through the communication and dissemination WP (WP9).

In the same way the ICT Liaison Group will produce guidance for setting up and sustaining a Smart City Design and Decision Platform. This SCDDS is a software tool built up from building level and based on a GIS grid that allows for a representation of the relevant aspects and flows. The guidance will contain what data need to be in place in order to fill the SCDDS, relevant examples of data protocols, choices to be made, the dilemma of openness in relation to privacy, barriers for application of the tool and how to overcome these, and contextual factors that should be in place for a smooth implementation. This task will be led by the City of Rotterdam that already has practical experience with this type of tool.

The Innovation and Business modelling Liaison Group will produce a guide on how to set-up and sustain local innovation platforms based on the lessons learned. This guide will be taken up by WP6, and will be used and validated in the follower cities (WP7) and will be further disseminated for application in other EU-cities. This specific task is led by SP.

The last deliverable is a joint product of all Liaison Groups: the Guide on innovation and ruggedized implementation of smart solutions, for which the Innovation and Business modelling Liaison Group will take the lead. It will contain guidance on how to use the smart energy district planner, how to use the Smart City Design and Decision Platform, setting up local innovation labs, and multi-actor financial arrangements and new business models, and especially what is needed to secure and foster implementation of smart solutions in EU-cities. This specific task is led by the University of Strathclyde.

Task 1.4 – Documentation of Lighthouse City experiences (Lead ICLEI; Participants: TNO, ROT, UME, GCC, SP, US, ISINNOVA) [M32-M60]

To facilitate the replication of the RUGGEDISED solutions within the Follower Cities and beyond a detailed Implementation Report from each Lighthouse City on the solutions implemented. These will be aimed at providing relevant information to inform and facilitate the potential replication of the solutions identified in other cities. They will contain:

1. Background/context – Key targets, policies and other implementation drivers and framework conditions

2. The integrated smart city framework developed and applied within the project

3. Detailed descriptions of each solution applied, covering (precise aspects covered may vary according to the nature of the solution being described):

- Technical implementation details

- Process descriptions presenting the different stages of the planning, procurement, implementation and monitoring process

- Business and contractual models applied, based on a thourough assessment of business structures and financing

- Integration with other solutions applied

- Relevant citizen/end user engagement activities

4. Results – Detailed information on the overall impacts of the implemented measures, together with individual results per solution where relevant

- Impact – on Energy efficiency, environmental performance, quality of life and social value

- Economic assessment – Quantified information on the economic impact of the measures implemented, in terms of costs for the public authorities involved, business cases for the private partners and investors, and impact on job creation and wider economic development

- Replication assessment – An initial assessment of the extent to which the technical solutions and the business/ contractual models implemented in the Lighthouse Cities, may be replicated in other European cities

The Reports will be produced by the Lighthouse Cities based on a template provided by ICLEI. The content of section 3 will be delivered within WPs 2-4 by the respective cities. Section 4 will be developed using monitoring data collected from WP5. ICLEI will also be responsible for editing and publishing each Report. The Follower Cities will review both the template and the draft reports to ensure these contain the information which potential replication would require. These packages will be developed progressively over the course of the project, with a version produced and published at the end of each project year, and made publicly available on the project website. They will draw heavily on the outcomes of monitoring and evaluation in WP5. Earlier versions will focus primarily on the details of the implementation measures themselves, and the processes/procedures followed, as well as any interim results achieved.

Participation per Partner

Partner number and short name	WP1 effort
1 - ROT	13.00
2 - UME	7.00
3 - GCC	7.00
4 - SP	11.00
5 - ISINNOVA	8.00
6 - AIT	10.00
7 - TNO	25.00
8 - ICLEI	4.00
9 - EUR	4.00
11 - US	13.00
Total	102.00

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D1.1	"Lessons learned on the implementation of smart solutions in the Lighthouses", interim report 1/3	7 - TNO	Report	Public	16
D1.2	Overarching innovation and implementation framework	7 - TNO	Report	Public	6
D1.3	"Lessons learned on the implementation of smart solutions in the Lighthouses", interim report 2/3	7 - TNO	Report	Public	28
D1.4	Guide for setting up and sustaining Local Innovation Platforms	4 - SP	Report	Public	30
D1.5	Prototype Smart Energy District planner	7 - TNO	Report	Public	40
D1.6	Guidance on Smart City Design and Decision Platform	1 - ROT	Report	Public	40
D1.7	"Lessons learned on the implementation of smart solutions in the Lighthouses", final report 3/3	7 - TNO	Report	Public	40
D1.8	Guide on ruggedized implementation and innovation of smart solutions	11 - US	Report	Public	40

Description of deliverables

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D1.1: "Lessons learned on the implementation of smart solutions in the Lighthouses", interim report 1/3 [16]

Based on task 1.1. This report contains the overarching innovation and implementation framework including the main technical and socio-economic challenges and contextual factors that influence (hampers or enforces) local innovation and the implementation of smart solutions in each of the lighthouse.

D1.2 : Overarching innovation and implementation framework [6]

Based on tasks 1.2 and 1.4. This report contains a detailed Implementation Report from each Lighthouse City describing background/context, the integrated smart city framework developed and applied within the project, and status of each solution applied. The report describes the details of the implementation measures themselves, the processes/procedures followed, and interim results achieved thusfar.

D1.3 : "Lessons learned on the implementation of smart solutions in the Lighthouses", interim report 2/3 [28]

Based on tasks 1.2 and 1.4. This report contains a detailed Implementation Report from each Lighthouse City describing background/context, the integrated smart city framework developed and applied within the project, and status of each solution applied. The report describes the details of the implementation measures themselves, the processes/procedures followed, and interim results achieved thusfar.

D1.4 : Guide for setting up and sustaining Local Innovation Platforms [30]

Based on task 1.2, 1.3 and 6.5. Report containing a guide on how to set-up and sustain local innovation platforms based on the lessons learned from Task 1.2 and experiences of Task 6.5. The Guide describes the concept of Innovation Platforms, the experiences in the Lighthouse cities, experiences in establishing similar structures in other cities and suggestions for important aspects to think about and things to avoid.

D1.5 : Prototype Smart Energy District planner [40]

Based on tasks 1.2 and 1.4. This report contains a detailed Implementation Report from each Lighthouse City describing background/context, the integrated smart city framework developed and applied within the project, detailed descriptions of solutions applied and their results.

D1.6 : Guidance on Smart City Design and Decision Platform [40]

Based on tasks 1.2 and 1.3. The smart energy district planner is a tool that supports decisions on measures to better integrate and optimize the local energy system to reach low carbon output. It will contain information on measures to be taken, dilemmas for integration of the energy system in relation to path dependency, barriers to overcome and how to recognise, involve and cooperate with important actors for the local energy system.

D1.7 : "Lessons learned on the implementation of smart solutions in the Lighthouses", final report 3/3 [40]

Based on tasks 1.2 and 1.3. The Smart City Design and Decision Platform is a software tool built up from building level and based on a GIS grid that allows for a representation of the relevant aspects and flows. The guidance will contain what data need to be in place in order to fill the SCDDS, relevant examples of data protocols, choices to be made, the dilemma of openness in relation to privacy, barriers for application of the tool and how to overcome these, and contextual factors that should be in place for a smooth implementation.

D1.8 : Guide on ruggedized implementation and innovation of smart solutions [40]

Based on task 1.3. The Guide on innovation and ruggedized implementation of smart solutions contains guidance on how to use the smart energy district planner, how to use the Smart City Design and Decision Platform, setting up local innovation labs, and multi-actor financial arrangements and new business models, and especially what is needed to secure and foster implementation of smart solutions in EU-cities.

Schedule of relevant Milestones

months)	Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
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Work package number ⁹	WP2	Lead beneficiary ¹⁰	1 - ROT
Work package title	Challenges an	d Solutions Rotterdam	
Start month	1	End month	60

Objectives

The main objective is to plan, implement and monitor the smart city demonstrations within the Heart of South area. The Heart of South is at the heart of Rotterdam-South, an area that will be deeply renovated during the years 2016-2021. The specific objectives for WP4 are:

- To increase the share of RES substantially and to optimise the use of RES and heat and cold in Heart of South.

- To use thermal waste streams as much as possible.

- To enable an efficient planning of the logistics partner thereby optimising the E-bus fleet.

- To integrate smart charging at parking lots, in order to minimise peak loads.

- to reduce the CO2 emissions and improve local air quality, and NOx by securing the roll out of electric vehicles (buses, cars, taxis) and reducing the number of private (diesel) cars.

- To create business models that enable local generation and selling of electricity and/or heat and cold.

- To involve the people who live, work, visit and enjoy in or at the Heart of South district

Description of work and role of partners

WP2 - Challenges and Solutions Rotterdam [Months: 1-60] **ROT**, TNO, ICLEI, EUR, BN, RET, ENE, KPN, FI

Task 2.1 Coordination and management of the lighthouse activities (Lead: ROT; Partners: TNO, BN) [M1-M60] A smart city governing group (the project management team) - including a Chief Productivity Officer (CPO) in the district that spots opportunities and that brings together the effected stakeholders - will be installed to ensure that the smart solutions which have been identified in the project will be completed. The group members will be TNO, ROT, BN.

Key tasks of the group will include:

- Developing and managing project plans to ensure that local activities are delivered on time and to cost.

- Coordinating the work of local partners in line with project plans.
- Identification and management of risks & issues and escalating where necessary.

- Managing project performance, including collation of required governance paperwork and reporting on local activities in respect of financial, legal, procurement and operational reporting conditions.

- Ensuring compliance with Horizon 2020 financial conditions of grant.
- Quality monitoring and enforcement of standards as required from Horizon 2020.
- Ensuring that all of the city's commitments to other vertical and horizontal work packages are delivered.

- Representing the local project externally and acting as the main point for communications

- Liaising regularly with the central urban planning department in the city in order to gradually integrate urban planning with the other pillars (mobility, energy, ICT). During the project, the precise connection will be explained on the basis of the progress of the project and integration will take form.

Note: the CPO's role is to be aware of the urban demand which he will put central in his quest to exploit opportunities, and the cities' activities as defined in this Work Package will thus be leading and shall be translated into business models. This aspect will have the CPO's focus during the project.

The smart city governing group will also support a Project Steering Group for Rotterdam which will bring together partners to oversee and monitor the delivery of local plans and as well as the city's commitments to other vertical and horizontal work packages. The Steering Group will meet on a quarterly basis for the duration of the Horizon 2020 project. Tasks will include (but not be limited to):

- Setting strategic direction for local project activities.

- Monitoring progress, including project milestones and deliverables against objectives.
- Change control and approval of variations.
- Monitoring financial spend and ensuring timescales are met.
- Monitoring risks & issues and intervening where appropriate.

A technical coordinator (BN) makes sure that all the technical aspects of the lighthouse project Heart of South are met. The Chief Productivity Officer (TNO) in the district makes sure that opportunities are identified and that innovations are implemented. Task leader: City of Rotterdam; Months: 1-60

Task 2.2 Increase the energy efficiency (Lead: ROT; Partners: BN, ENECO, RET) [M1-M36]

As stated, the centre of South will be deeply renovated. In order to revitalise it as the secondary centre in Rotterdam-South, a major renovation is planned, aiming to make the centre compliant with current requirements on sustainability and functionality, and based on a novel procurement strategy. After a so-called competitive dialogue with potential contractors on how to develop this area and maintain it for 20 years, the company offering the most quality for a fixed price was selected. Because of this long period of exploitation, which is unique, many sustainable measures become economically viable. This method of procurement has never before been performed in the Netherlands, nor in Europe, and is highly replicable since there are many similar complexes in Europe dating from the same period.

Thermal Smart Grid

To explain the Rotterdam Lighthouse measures on energy and integrated infrastructures first some further explanation of the Rotterdam Energy Approach Planning (REAP) is preferable. This REAP is the main strategy of the city of Rotterdam on how to realize maximum efficiency on the use of energy in buildings as well as in the public space, on district-level as well as on city-level. It's based on three pillars. The first pillar has the basic focus on how to reduce the energy-demand as much as possible, based on the high ROI of this kind of measures. The second pillar is the follow up of the first step and has the goal to re-use as much as possible all kind of wasted flows of energy. And the third and last pillar completes the strategy and is basically focused on the needed remaining energy-demand. This residual energy demand has to be complied with renewable energy sources as much as possible. By doing so the desirable energy transition actually will take place.

The renovation of the Heart of South district will take place in phases. Major parts are the sustainable integration of the 50-meter swimming pool in a former office block, the renovation of the existing exhibition halls Ahoy that will be integrated in the construction of the new convention centre, the renovation of the bus- and metro station and arts building and the modernization and expansion of the shopping centre on the first floor. Construction all together will take approximately 6 years. Sustainability and energy savings in all buildings in the Heart of the South are of utmost importance. Almost all objects will get a "BREEAM" 'very good' label. Energy demand will decrease by 50% due to sustainability measures compared to 2007. The demand for heating and cooling in new buildings will be minimalized using a very good thermal shell. Heat recovery through ventilation systems, through flushing, through shower and make-up water will be utilized. Other aspects include the use of LED lighting, floor and roof insulation the covering of the pools, light coloured roofs and high performance (HR++) glass. Special attention is put to airtightness of the buildings. Within the REAP most of these measures can be defined as measures concerning the first pillar, which as said, has the aim to reduce the demand of energy.

But in addition of these more or less already conventional measures which are already funded within the Heart of South project itself, the Rotterdam Lighthouse project introduces several innovative integrated energy infrastructure elements to make sure that also the goals of the pillars two and three of the REAP will be challenged to the max.

The principle is that the initial energy infrastructure serves as a basis to which other buildings can be connected in time. Because these buildings have different functions and energy consumption profiles during the day and week, new connections offer possibilities for local energy exchange. Total energy demand will decrease and the total infrastructure can be dimensioned smaller due to peak shaving. Integrated Infrastructures at its best!

SMART SOLUTION R1: Geothermal heat-cold storage and heat pumps BN, ENECO

One of the main goals of the project is to connect the large buildings in the area (e.g. the existing and new parts of the exhibition center Ahoy, The Congress Center, the new to build Arts building as well as the 50-m swimming pool (in a former office building), to one thermal grid to enable local heat and cold exchange with a lower total cost of ownership. To maximise the use of waste heat and cold, seasonal storage is used in a geothermal layer (heat-cold storage). All buildings are connected by a low temperature grid and each building will get a heat pump to provide in the heat needed. The waste heat of the condenser is fed back into the heat-cold storage. High temperature cooling is provided directly from the smart geothermal grid. And later on, other buildings e.g. the cinema, hotel and hospital can be connected to this grid, as well as a variety of other energy sources will be connected. Because of the diversity of functions of the connected buildings and the energy sources, therefore the peak demands on different times needs a lower total base load. This will save on installations which can be dimensioned smaller, due to this decreasing total demand of energy.

SMART SOLUTION R2: Thermal energy from waste streams BN, ENECO, ROT

Besides the above the use of other thermal waste streams (RES) will be stimulated as much as possible by making further connections to the thermal smart grid. On building scale the thermal energy from the waste water of the showers in the swimming pool is retrieved to pre heat the hot tap water without storage. On large scale the district sewage water from nearby households is used to distract heat or cold from it and use it in the geothermal smart grid. Depending on the demand it can be used directly or stored for a season, regenerating the storage and create a thermal balance. With 15 meters of heat exchanger in the big sewage system, around 30 kW of power can be used.

SMART SOLUTION R3: Surface water heat-cold collection BN, ENECO

A monitoring project on the energy potential of district sewage water in direct combination of pavement heating and cooling is set up and will become operational already in 2016. With 1 m2 sewage heat exchanger around 40 m2 of pavement can be kept frost free. Together with putting a heat exchanger under the surface in the pavement/road, heat and cold can be extracted from the surface and stored in the heat-cold storage system.

SMART SOLUTION R4: Pavement heat-cold collector BN, ENECO, ROT

Which at the same time leads to a frost free kept pavement in winter times, especially at the intensively used slopes of the bus station to prevent the bus from sliding. Also a walking trail "red carpet" can be heated from the bus station to the Ahoy exhibition center. In summer time the pavement is cooled, which rises its lifetime and contributes positively to the city climate and related heat island effect.

Since the buildings connected to the smart geothermal grid use more heat than cold, a balance should be created by adding cold to the storage system. Surface water nearby the Ahoy exhibition halls and the Hoornbeeck College (school building) will be used to provide in this. And although the total energy demand drops in the area, at certain times there will be a large peak demand. For this remaining demand a connection with the city heating will be made into the lower temperature grid in order to raise the energy efficiency of the total system. The connection to the city district heating provides by doing so in the demand of energy when alternative heat sources are not sufficient in providing foreseen peak loads.

Electric Smart Grid

Besides the introduction and installation of the thermal smart grid, there will also be a development of an electric smart grid as well. This electric smart grid by using PV-panels and Solar thermal panels on the surface of the roofs of the heart of south buildings will be installed. The solar collectors on houses and the swimming pool are installed for generating hot tap water. The hot water is used directly, without storage. Also electrical solar energy production and thermal energy production can be combined. In that way the most energy per m2 roof area is utilised.

The aim is furthermore to maximise the use of RES by photovoltaics (PV) as a part of the electric smart grid and to lower the dependence of the electricity grid. This is done as follows:

- PV on the whole roof of the Congress Center, with the aid of national RES funding (SDE+), the city of Rotterdam will use this roof to lower their carbon footprint and promote RES.

- PV on the roof of the bus station Zuidplein, RET will use this roof to partly provide in the energy demand of the bus station for e.g. lighting to lower their carbon emissions. Also three other nearby metrostations will be equipped with roof PV's.

- PV on the roofs of the swimming pool, the arts building, the Ahoy exhibition center Ahoy (existing and new) and of the new parts of the Shopping mall.

The citizens of Heart of South and the neighbouring areas are invited to join and participate in an energy cooperation - using developed legal arrangements - that allows them to own or lease PV on the mentioned roofs. This is stimulated by lower energy tax rates and a better energy label for their own house. This is especially interesting for citizens who do not have a suited roof, live in a (rented) apartment. In and around Heart of South this is often the case.

SMART SOLUTION R5: DC grid, PV and storage for mobility (RET, BN, ENECO, EUR)

For feeding in RES in the grid, the challenge is the unpredictable production of PV and poor production in winter. To optimize and prevent gaps in the production of RES, it's necessary to install systems independent of sun radiation. Urban wind is a good choice there, since with shaded weather it's often windy especially on the location of Rotterdam since it's close to the shore. The new generation urban wind turbines is much more efficient. It works best with turbulent flows, so it's well suited for the build environment. Each turbine generates around 1,5 kW on power and the rotor has a diameter of 1,5 m. Since it's a very visible RES solution, the installation on the Ahoy exhibition centre location is the best, also for its height.

The ambition is also to introduce zero-emission public transport in the south of Rotterdam in the upcoming years at large scale, and this needs off course some severe preparations, like adjustments to the electric grid. Since the existing grid at the bus station cannot provide all the power for quick charging electric buses of the RET, a challenge is how to make this in a low carbon and cost effective way. Since there is a suited roof nearby the bus station, as said PV can be

placed there and deliver the energy directly off grid to a battery storage at the bus station via a DC cable. By using DC all the way, all DC-AC and back conversions can be prevented which increases the energy efficiency with around 15%. This coupling of RES and Mobility shows that integration of these systems is beneficial.

Note: Integrating large numbers of electric vehicles as well as RES into the grid will doubtlessly have an impact on the grid itself. The challenge that ROT takes on is to realise a connection with a substantial amount of electric vehicles to the grid, as well as to feed this grid as much as possible with alternative energy sources. The commissioning of electric vehicles (mainly public transport) through the use of appropriate software (and data), will be the focus during the project. The impact will be described and analyzed thoroughly.

SMART SOLUTION R6: Smart charging parking lots (RET, BN, ENECO, EUR)

Since the area electricity grid is almost at its maximum capacity, it is efficient to use regular power but with 2 way energy flow. By foreseen smart charging at parking lots, peak loads are thus minimised. If in the future variable electricity prices are there, the car can be charged for the lowest energy prices, which indirectly stimulates a better usage of RES production.

Task 2.3 Integration of E-Mobility (Lead: RET; Partners: EUR) [M1-M36]

SMART SOLUTION R7: Optimising the E-bus fleet RET, EUR

The regional public transportation company, RET, operates a huge multimodal public transport junction in the Heart of South. The route network contains 2 metro lines and over 30 buslines and on a yearly basis over 12 million passengers use both metro and bus. To increase air quality, to reduce greenhouse gas and to be part of the energy transition, the RET as a modern company has the ambition and goal to make their public transport operations more sustainable. And the upcoming renovation and redevelopment of the transport hub within the Heart of South offers excellent opportunities for an ambitious zero emission program. The RET needs to renew his bus fleet (now over 250 buses mostly conventional fossil fuel buses) from 2018/2019 and the target is to change the busfleet significantly into a zero-emission busfleet. Within this project, the upscaling to electric mobility of buslines in the new concession period will be prepared.

The challenge and innovation is to introduce zero emission buses successfully on a large scale, while at the same time the reliability of the timetables of the public transport at all situations and at all times has to be guaranteed. As said within approximately three years a very large amount of conventional diesel buses of the RET have to be replaced in stages by zero emission buses. Besides the installation of an e-charging station at the Heart of South busstation the RET needs therefore to discover and explore the logistic variables which will be introduced by using e-buses on a large scale. A complex upgrade of the planning software used nowadays therefore is a necessity and this software will be purchased. The ICT system has to correspond with the charging infrastructure and the vehicles itself. Lay overtimes for example because of the necessary charging will be influenced and this will certainly have effects on the timetables. With the use of the right software modules these challenges can be managed properly. The reliability of the needed ICT planning software has to be 100% at all times and has to be tested and developed in real time to experience the effects on the complex logistic operations. For reaching the optimal result, including the exploration of city distributions, actual simulation models of the Erasmus University Rotterdam will be used as well. The RET starts to use six E-buses and will purchase, besides the right ICT, also a charging station on the Heart of South station, with the goal to expand the total number later on. The charging station will be especially designed for the massive and quick charging of city operating E-buses. The purpose is also to design and develop the charging stations in such a way that 'opportunity charging' (Echarging during the public transport timetable) will be possible. The transition into zero-emissions buses will lead to a substantial improvement of the air quality as well as severe savings of fossil energy. By making the bus fleet more sustainable in the South of Rotterdam, off course this knowledge can and will be used in the rest of the public transport domain of the RET.

The use of RES (PV on the roof of the metro station) will be incorporated via the electric smart grid, as well as the opportunity for e-charging for other private users will be explored to make for example e-city distribution possible. Large scale truck- or bus charging during hours outside (or maybe even within) the time schedule of the operations of the public transport can be helpful to the transition of the use of energy in professional logistics, like the provision of goods for shops or other enterprises. It is preferable to look into such opportunities, also because of the deviating charging needs of trucks which supplies the nearby music hall (evening- and night times instead of daytime-charging).

As mentioned earlier, integrating large numbers of electric vehicles as well as RES into the grid will doubtlessly have an impact on the grid itself. The impact will be described and analyzed thoroughly.

Furthermore, within the parking facilities of the shopping mall, the exhibition centre and the public space in the Heart of South some approximately 25 extra E-charging points will be installed and connected to electric grid. Privately owned electric vehicles in especially the south of the city will be stimulated by doing so, resulting in better air quality. The stored battery capacity of these e-vehicles will be used and redelivered to the electricity net when these cars are not in

use. Furthermore of course visitors of the shopping mall, but also commuters can charge their electric vehicles while doing' their shopping and so on.

Task 2.4 Enabling low-carbon ICT solutions/infrastructure (Lead: KPN; Partners: ENECO, BN) [M1-M36]

Within this task a lot of the effects of all the different activities and energy measures come together. Smart ICT-solutions will ensure that the demand and the supply of all the buildings involved is managed excellently. The data concerning the demand and supply of the use of energy of all the individual buildings are gathered with smart meters and based on the BIM-models, the Building Information Model. The BIM-method yields much insight and leads to efficient and effective design, construction and management of the entire area, including the public space and his sub-surface. In addition to the regular operation of this BIM-model during the design and construction phases, Ballast Nedam will now also use it to monitor the use and performance of the buildings for 20 years. By making this model appropriate in time, it measures not only the use of energy of each individual building during a period of time, but also the costs of maintenance. Using the BIM-method like this leads to information to manage the building process (design, construction and management of the entire area), and also to a better energy- and maintenance performance during 20 years afterwards.

SMART SOLUTION R8: Energy Management

A lot of data gathered as effects from all the different activities and energy measures come together and can and will be analysed thoroughly. Smart ICT-solutions will ensure that the demand and the supply of energy of all buildings and the public space (including sub-surface structures) involved is managed excellently. By connecting the gathered data to a data-exchange platform (defined server or cloud-application) subsequently the overall energy management system can operate the energy flows between the different assets (buildings and public space!) in the most efficient way. A dynamic continuously matching equilibrium between assets with a need of energy and assets with a demand of energy will become active. This approach yields deeper insight resulting in efficient and effective energy management of the entire area (but also maintenance). And with the knowledge of EUR-models, concerning also the economic analysis of energy consumption behaviour, the energy management will be fully optimised. Preventive maintenance and energy efficient behaviour is promoted.

SMART SOLUTION R9: 3-D City operations model

The data concerning this movement of the energy flows of the involved assets are furthermore transported to a newly developed 3-D city operations model. This innovative model is especially developed for and with the City of Rotterdam by SME Future Insight and is ready for implementation on broader scale. And will function as the center piece of the ICT approach.

This model shows and visualises the real time energy surplus or deficit as well as the development over a period of time of the individual buildings as well as the whole area. Due to the open standards of the model the data are accessible for everyone. It therefore helps to continuously analyse the area on the need of energy.

The 3-D model in this proposal shows in 3-D the energy-aspects of the buildings in the Heart of South area. The use and savings of energy of each building will be made visible in real time. An energy surplus or deficit as well as the development over a period of time of the individual buildings as well as the whole area can be made visible. Just like for example the geo-thermal potential, the district heating potential as well as the solar potential. Everyone in the community will have access to these data due to the use of open standards and because of this, soon, so is to be expected, this 3-D model itself will become a powerful resource for the improvement of further innovation.

SMART SOLUTION R10: LoRa-network and SMART SOLUTION R11: Efficient and intelligent street lighting Besides the energy management system and the 3-D model, also an important aspect of the project is the introduction and unroll of the KPN-LoRa network. The introduction of this network operated by KPN makes all kind of sensor techniques in the Heart of South area possible (and later on in the entire city and furthermore). At low costs, because the used technique ensures that therefore Wifi or nowadays still expensive 4-G is not required and needed.

One of the main first users of the LoRa network will be the public lighting system. Transport of data generated by the sensors in the public lighting will be made possible in an economic feasible way. And together with the newly developed and introduced ICT protocol AliS (Astrin Lighting interoperability Standard), all the public lighting hardware from multiple vendors can be controlled through a single portal. Measurements of all types of sensors can be read and analysed. By using the AliS-protocol and the LoRa-netwerk central monitoring of public lighting by remote management is thus possible, which leads to an automation and thus pro-active detection of failures. And even more, the analysis of the dataflow can also lead to custom-made solutions like increasing the lux-level when people pass by (or decreasing off course at more quietly periods). And adjustments to weather conditions become possible as well. The introduction of new lighting LED-techniques and the application of the AliS protocol will lead to an energy reduction of 50 to 70%. The aim is to spread this technology across the city and elsewhere in the coming decade. That should lead to a citywide reduction of energy use of 50 to 70% and estimated monetary savings of \in 12 million Euros. Finally, with "light-
mapping" (night time aerial photographs, which are analysed at a detailed level to determine the light strength in the city) adjustments can be made to the amount of lighting so the lighting-demand which is needed by the area is fulfilled.

Later on, the LoRa-network will make dozens of applications possible. The network is meant for equipment which doesn't constantly has a need for an own internet connection, but only now and then has to transport some data. Not only in favour of public lighting, public transport and e-mobility (is the bus arriving in time? Where's a free (e-) parking place?), but also many private and commercial applications can be developed. The LoRa-network will invite both the public as private sector to develop and operate sensor techniques at large scale. The Internet of Things will be made possible, at low costs.

Both the innovative 3-D model as well as the introduction of the LoRa-network are smart city services itself, and both present lots of opportunities to further exploration of innovative developments.

SMART SOLUTION 12: High performance servers in homes (Lead: ENECO) [M-M]

A final example of application is also to utilize high performance servers in nearby homes, thereby creating highly distributed computing power (computing facilities, data centres) while heating homes for free at the same time and drastically reducing overall CO2 emissions.

Task leader: ENECO

SMART SOLUTION R13: Smart Waste Management (Lead: KPN; Partners: ENECO) [M1-M36]

And, last but not least, an approach starts with smart waste traffic in Rotterdam South. For garbage disposal, in total, in Rotterdam 2,600 kilometers per day are driven (R4B). Smart waste traffic is achieved by using sensors to measure the degree of filling of the containers. For transporting these data the possible use of the LoRa-network will be explored and the data will be monitored via a central portal. The purpose of the measure is a reduction of 20% of the number of kilometers driven. This results in a CO2 reduction of 280 kilograms of CO2 / driving day (728.000 kilograms per year), besides of course a saving of, still mostly fossil, fuel costs. After the pilot in Rotterdam South for a route to retrieve waste paper and after analysis and any amendments thereof, the system is provided to roll out the measure to the other types of waste by the end of 2018.

Task 2.5 Smart city services to the community (Lead: FI; Partners: KPN, EUR) [M1-36]

The 3-D platform functions as an open communication platform, as a 'window' for IoT developments and makes further innovation possible by making data available for everyone. The platform will also be enlarged with all kinds of users and different kinds of datasets. For the purpose of analyses this creates almost never-ending opportunities. The 3-D model is to be expanded geographically in the near future, allowing to make further connections with other nearby buildings or even entire neighbourhoods. And off course, the 3-D model is also to extend with other types of spatial 3-D characteristics of the area, both commercial as public, creating multi-use synergies. The possibilities for all kinds of data streams that are already going through the city to be unlocked by a central platform, accessible for everyone, are endless in this case. One can think of public transport information (Where is exactly my tram? I have to go now!), commercial information (shops can link their website to their virtual property, or even offering a virtual tour through the store, a store can offer their goods in 3D and real estate agents can visualize their properties for sale) and of course all sorts of applications around city maps, city tours, etc. are possible as well. These are only a limited number of examples. The possibilities are endless, it is up to "the market" to explore and exploit the full potential of the model. Innovation that extracts innovation!

An information centre will be realised where citizens, businesses, officials, academics etc. can receive an introduction to the 3-D platform functionalities and work together on new applications.

The city of Rotterdam realizes that the model could meet boundaries in the daily operations of the model. The city of Rotterdam therefore has also the aim to discover the boundaries of such a 3-D approach (e.g. privacy matters of the use of data), but sees this as a challenge to overcome and to make, in the end, the existing technology far more ready for practical use.

Besides the energy management system and the 3-D model, also an important aspect of the project is the introduction and roll out of the KPN-LoRa network. The introduction of this network operated by KPN makes all kind of sensor techniques in the Heart of South area possible (and later on in the entire city and furthermore). At low costs, because the used technique ensures that therefore Wifi or nowadays still expensive 4-G is not required and needed.

One of the main first users of the LoRa network will be the public lighting system. Transport of data generated by the sensors in the public lighting will be made possible in an economic feasible way. And together with the newly developed and introduced ICT protocol AliS (Astrin Lighting interoperability Standard, as also described in task 4.3.), all the public lighting hardware from multiple vendors can be controlled through a single portal. Measurements of all types of sensors can be read and analysed. By using the AliS-protocol and the LoRa-network central monitoring of public lighting by

remote management is thus possible, which leads to an automation and thus pro-active detection of failures. And even more, the analysis of the dataflow can also lead to custom-made solutions like increasing the lux-level when people pass by (or decreasing off course at more quietly periods). And adjustments to weather conditions become possible as well.

Later on, the LoRa-network will make dozens of applications possible. The network is meant for equipment which doesn't constantly has a need for an own internet connection, but only now and then has to transport some data. Not only in favour of public lighting, public transport and e-mobility (is the bus arriving in time? Where's a free (e-) parking place?), but also many private and commercial applications can be developed. The LoRa-network will invite both public as private sector to develop and operate sensor techniques at large scale. The Internet of Things will be made possible, at low costs.

Regional upscaling

KPN has two roles within the Rotterdam Consortium. It will deploy and maintain a LoRa networking in the area and the whole of the Netherlands. Innovation on the LoRa network will be done on private LoRa networks within buildings so that there is an extra layer of security on the network and extra options for information gathering and analysis. KPN wants to use the experience of the first private LoRa networks to strengthen its commercial portfolio and further strengthen the LoRa penetration within the IOT market in the Netherlands. LoRa was and is the first real IOT only platform, but soon the competition will follow with other standards and it is important to gain as much market share as possible.

Second role is the data hub that will be the place where all the data is stored securely and where the data analytics can take place. The data hub will be agnostic and therefore connectible to any given IOT platform possible via API's . It needs to be a robust, resilient and flexible data hub underlying the 3D model and the different IOT platforms. KPN wants to demonstrate that the owner of the data can store the data on KPN's servers without any trust issues. KPN believes that trust is the single most important reason for a platform to succeed. Because of our role in protecting the critical infrastructure of the Netherlands we believe also that municipalities and high risk companies are our natural clients for data storage. Through this demonstration in Rotterdam we want to complete the development phase and start to deploy in other cities, municipalities, government (agencies), banks, insurance companies etc.

We strongly believe that with the LoRa network and the secure data hub we have a lot to offer and all our strategies are based on this.

Building Management System

The building management system is used for monitoring and optimalisation of the (energy) use of the buildings within Hart van Zuid. One of the main functions of the management system is to automatically interpret and analyze building information by thousands of existing algorithms. These algorithms are being optimized by the addition of new building. The buildings in HvZ have such a specific function that the data of these buildings is highly valuable to optimize and create new algorithms.

On the other hand, the data from the different building is used to create an area-wide analyse of the energy-demand and supply to optimize the usage of sustainable energy and so reduce the usage of non-sustainable sources. In the nearby future Eneco foresees that the demand of sustainable (local generated) energy will grow exponential. Therefore collaboration between buildings as energy suppliers and energy-user is inevitable. The experience and innovation in this specific project will be used to implement the system in other area's like HvZ, such as Utrecht Stationsgebied, The Wilhelminapier in Rotterdam, the city center of the Hague.

Task 2.6 Activating the local innovation ecosystem (Lead: BN) [M1-M36]

In this project special attention is paid to maximising the social effects of the upgrade.

This manifests itself in providing learning- and workplaces for those who experience difficulties entering the labour market. But also in organizing events to positively highlight the area. By doing this the entire area is made more interesting for its residents and business and new target groups are attracted. By supporting easy involvement and participation of citizens to urban development, e.g. via better opportunities to effect and give feedback, we significantly reduce e.g. urban planning timescale and amount of complaints about new plans. The zoning plan was created in an interactive co-creation and planning process to involve the population in the plans and the area. Residents of the area are involved in the urban planning process through value engineering sessions. Hereby we improve the sense of collective ownership of the area, and thereby strengthen the social network in this part of Rotterdam Zuid.

In the zoning- and urban plan process Ballast Nedam developed the knowledge to involve stakeholders in an interactive planning process so that maximum support is created among the population.

It is exactly this knowledge that will be utilized to increase support for technical solutions such as the Geothermal heatcold storage and heat pumps and the Energy Management system. The challenge is not in the technical application of solutions, but far more in the organization of a region-wide collaboration in which all stakeholders contribute to the realization of an energy neutral area. The interactive approach by Ballast Nedam involves all major stakeholders in the region, without losing attention for the individual home-owner. Involving all stakeholders in the process is an important condition for realizing an intelligent, user-driven and demand-oriented city infrastructure.

In addition, open data will be used to keep citizens informed through the 3-D model. Task leader: BN, Months: 1-36

To increase impact Rotterdam will also develop a Smart City Implementation Package containing all information necessary to allow for replication in a wider community of EU-cities.

To maximise the potential for other cities to replicate the solutions being implemented, a detailed Implementation Report will be produced for each city (to be updated twice after its first delivery in M36). This will follow a project template established in WP1. The individual solution Implementation Reports will be combined within WP1 into a Lighthouse City Implementation Report.

Participation per Partner

Partner number and short name	WP2 effort
1 - ROT	49.00
7 - TNO	6.00
8 - ICLEI	3.00
9 - EUR	34.00
16 - BN	31.00
17 - RET	35.00
18 - ENE	33.00
19 - KPN	34.00
31 - FI	30.00
Total	255.00

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D2.1	Data privacy report of the 3-D model	31 - FI	Report	Public	24
D2.2	Report on implementation LoRa- network on low cost new sensors techniques for HoS area	19 - KPN	Report	Public	12
D2.3	Introduction first six zero emission e-buses	17 - RET	Other	Public	24
D2.4	Implementation of efficient and intelligent street lighting in HoS (adjustable intensity to real time needs)	1 - ROT	Other	Public	30

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷	
D2.5	Sensors to measure filling of waste containers implemented (Smart waste management)	1 - ROT	Other	Public	30	
D2.6	Implementation Report Rotterdam (1/3)	1 - ROT	Report	Public	36	
D2.7	Guidelines ready for share of data between buildings related to Energy Management optimalisation	1 - ROT	Report	Public	42	
D2.8	Plan for re-use of waste streams to produce thermal energy	16 - BN	Report	Public	46	
D2.9	Plan for balancing geothermal heat-cold storage system by using surface water	16 - BN	Report	Public	48	
D2.10	Plan for balancing geothermal heat-cold storage system by using heat exchanger under pavement/road	16 - BN	Report	Public	50	
D2.11	Report on PV panels implemented near bus station for battery storage	18 - ENE	Report	Public	46	
D2.12	Report on new parking lots implemented for Smart charging	18 - ENE	Report	Public	48	
D2.13	Report on thermal distribution system built for exchange system based on low- temperature thermal grid	16 - BN	Report	Public	48	
D2.14	Report on feasibility study for implementation first pilot "Nerdalize"	18 - ENE	Report	Public	48	
D2.15	Implementation Report Rotterdam (2/3)	1 - ROT	Report	Public	48	
D2.16	Implementation Report Rotterdam (3/3)	1 - ROT	Report	Public	60	
		Description of deliver	rahles			

D2.1 : Data privacy report of the 3-D model [24]

Based on Task 2.4. A report on the results of the implementation of LoRa in the context of the project. The report will contain a description of the effect of the LoRa-network on the introduction of new low-cost sensors in the practice area.

D2.2 : Report on implementation LoRa-network on low cost new sensors techniques for HoS area [12]

Based on Task 2.4. A report on the 3D-City Operations model with special focus on privacy issues.

D2.3 : Introduction first six zero emission e-buses [24]

Based on Task 2.3. The introduction of six E-buses by RET.

D2.4 : Implementation of efficient and intelligent street lighting in HoS (adjustable intensity to real time needs) [30]

Based on Task 2.4. New LED-techniques are introduced in the public lighting system and the public lighting system in the project area is connected to the LoRa-network. Data generated by sensors in the public lighting is transported by the LoRa-network.

D2.5 : Sensors to measure filling of waste containers implemented (Smart waste management) [30]

Based on Task 2.5. Waste containers are fitted out with sensors that are connected to LoRa-network.

D2.6 : Implementation Report Rotterdam (1/3) [36]

To facilitate the replication of the RUGGEDISED solutions within the Follower Cities and beyond a detailed Implementation Report from each Lighthouse City on the solutions implemented. These will be aimed at providing relevant information to inform and facilitate the potential replication of the solutions identified in other cities. They will contain: 1. Background/context – Key targets, policies and other implementation drivers and framework conditions 2. The integrated smart city framework developed and applied within the project 3. Detailed descriptions of each solution applied, covering (precise aspects covered may vary according to the nature of the solution being described): - Technical implementation details - Process descriptions presenting the different stages of the planning, procurement, implementation and monitoring process - Business and contractual models applied - Integration with other solutions applied - Relevant citizen/end user engagement activities 4. Results - Detailed information on the overall impacts of the implemented measures, together with individual results per solution where relevant -Impact – on Energy efficiency, environmental performance, quality of life and social value - Economic assessment - Quantified information on the economic impact of the measures implemented, in terms of costs for the public authorities involved, business cases for the private partners and investors, and impact on job creation and wider economic development - Replication assessment - An initial assessment of the extent to which the technical solutions and the business/contractual models implemented in the Lighthouse Cities, may be replicated in other European cities The Reports will be produced by the Lighthouse Cities based on a template provided by ICLEI.

D2.7 : Guidelines ready for share of data between buildings related to Energy Management optimalisation [42] Based on Task 2.5. Guidelines on the collaction, storage and sharing of data of (energy) use of buildings in the project scope.

D2.8 : Plan for re-use of waste streams to produce thermal energy [46]

Based on Task 2.2. A plan for the collection and re-use or storage of available waste heat from e.g. the swimming pool.

D2.9 : Plan for balancing geothermal heat-cold storage system by using surface water [48]

Based on Task 2.2. A plan for the collection and storage of heat and cold from e.g. road surface.

D2.10 : Plan for balancing geothermal heat-cold storage system by using heat exchanger under pavement/road [50] Based on Task 2.2. A plan for the collection and use of heat and cold for the purpose of keeping pavement frost free during winter and cooled during summer.

D2.11 : Report on PV panels implemented near bus station for battery storage [46]

Based on Task 2.2 and Task 2.3. A report on the results of implementing PV panels near the bus station.

D2.12 : Report on new parking lots implemented for Smart charging [48]

Based on Task 2.2. A report on the results of outfitting parking lots with smart charging points.

D2.13 : Report on thermal distribution system built for exchange system based on low-temperature thermal grid [48]

Based on Task 2.2. A report on the outlay, working and results of the newly establised thermal distribution system.

D2.14 : Report on feasibility study for implementation first pilot "Nerdalize" [48]

Based on Task 2.4. A report on the feasibility of using high performance servers in houses nearby the project area.

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D2.15 : Implementation Report Rotterdam (2/3) [48]

To facilitate the replication of the RUGGEDISED solutions within the Follower Cities and beyond a detailed Implementation Report from each Lighthouse City on the solutions implemented. These will be aimed at providing relevant information to inform and facilitate the potential replication of the solutions identified in other cities. They will contain: 1. Background/context – Key targets, policies and other implementation drivers and framework conditions 2. The integrated smart city framework developed and applied within the project 3. Detailed descriptions of each solution applied, covering (precise aspects covered may vary according to the nature of the solution being described): - Technical implementation details - Process descriptions presenting the different stages of the planning, procurement, implementation and monitoring process - Business and contractual models applied - Integration with other solutions applied - Relevant citizen/end user engagement activities 4. Results - Detailed information on the overall impacts of the implemented measures, together with individual results per solution where relevant -Impact - on Energy efficiency, environmental performance, quality of life and social value - Economic assessment - Quantified information on the economic impact of the measures implemented, in terms of costs for the public authorities involved, business cases for the private partners and investors, and impact on job creation and wider economic development - Replication assessment - An initial assessment of the extent to which the technical solutions and the business/contractual models implemented in the Lighthouse Cities, may be replicated in other European cities The Reports will be produced by the Lighthouse Cities based on a template provided by ICLEI.

D2.16 : Implementation Report Rotterdam (3/3) [60]

To facilitate the replication of the RUGGEDISED solutions within the Follower Cities and beyond a detailed Implementation Report from each Lighthouse City on the solutions implemented. These will be aimed at providing relevant information to inform and facilitate the potential replication of the solutions identified in other cities. They will contain: 1. Background/context – Key targets, policies and other implementation drivers and framework conditions 2. The integrated smart city framework developed and applied within the project 3. Detailed descriptions of each solution applied, covering (precise aspects covered may vary according to the nature of the solution being described): - Technical implementation details - Process descriptions presenting the different stages of the planning, procurement, implementation and monitoring process - Business and contractual models applied - Integration with other solutions applied - Relevant citizen/end user engagement activities 4. Results - Detailed information on the overall impacts of the implemented measures, together with individual results per solution where relevant -Impact – on Energy efficiency, environmental performance, quality of life and social value - Economic assessment - Quantified information on the economic impact of the measures implemented, in terms of costs for the public authorities involved, business cases for the private partners and investors, and impact on job creation and wider economic development - Replication assessment - An initial assessment of the extent to which the technical solutions and the business/contractual models implemented in the Lighthouse Cities, may be replicated in other European cities The Reports will be produced by the Lighthouse Cities based on a template provided by ICLEI.

Schedule of relevant Milestones

multiper months)	Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
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Work package number ⁹	WP3	Lead beneficiary ¹⁰	2 - UME
Work package title	Challenges an		
Start month	1	End month	60

Objectives

The objectives of WP2 are to:

- demonstrate smart energy efficiency and measures in the University city district and innovation area in Umeå

- increase the share of renewable energies in the innovation area

- demonstrate e-mobility solutions in the innovation area

- introduce smart and open monitoring systems for energy performance and user behaviour in the prioritised tasks and solutions

- reduce the CO2 emissions and improve local air quality, NOx by securing the roll out of electric vehicles (buses, cars, taxis) and reducing the number of private (diesel) cars

- strengthen the project outcomes and collaboration through novel business models between the local project partnership - to involve the people who live, work, visit and enjoy the University city district

Description of work and role of partners

WP3 - Challenges and Solutions in Umeå [Months: 1-60] **UME**, SP, ICLEI, UU, AHAB, VCC, UEAB, UPAB

Task 3.1 Coordination and management of the lighthouse activities (Lead: UME; Partners: -) [M1-M60]

The City of Umeå Planning department will coordinate the cooperation between the local partners and delivery of the light house activities. The implementation of smart city solutions will effectively all start at M1 by aligning and fine-tuning the organisational, financial and operational details set out during the preparation of this proposal.

Umea will establish a smart city governing group (Programme Management Office, PMO) - including a Chief Productivity Officer (CPO) in the district that spots opportunities and that brings together the effected stakeholders - to oversee the delivery of its commitments within the Horizon 2020 project.

These entail:

- Detailing the implementation plan. Each local partner will detail the tasks of implementing the smart solutions in the Umeå district, the other partners involved and their responsibilities, the associated target dates and task dependencies, the procurement procedure, and financial and communication planning. Given the complexity of the tasks at hand, the deployment, monitoring and evaluation of each solution will be managed with the assistance of professional monitoring software.

- Finalising the outstanding ground-setting activities, including, for example, operationalisation of procurement, permissions and regulations, etc.

Including the implementation plan in the routine operation of the respective local partner for continued discussion, engagement of people and stakeholders, monitoring of progress and management of deviations and further opportunities
Sharing existing knowledge and experience regarding implementation procedures among the lighthouse cities by taking care of the engagement of the city's experts and local partners in (the working groups of) primarily WP1, WP6 and WP 7
Liaising regularly with the central urban planning department in the city in order to gradually integrate urban planning with the other pillars (mobility, energy, ICT). During the project, the precise connection will be explained on the basis of the progress of the project and integration will take form.

Note: the CPO's role is to be aware of the urban demand which he will put central in his quest to exploit opportunities, and the cities' activities as defined in this Work Package will thus be leading and shall be translated into business models. This aspect will have the CPO's focus during the project.

The PMO will also support a Project Steering Group for Umea which will bring together partners to oversee and monitor the delivery of local plans and as well as the city's commitments to other vertical and horizontal work packages. The Steering Group will meet on a quarterly basis for the duration of the Horizon 2020 project. Tasks will include (but not be limited to):

- Setting strategic direction for local project activities.

- Monitoring progress, including project milestones and deliverables against objectives.

- Change control and approval of variations.

- Monitoring financial spending and ensuring timescales are met.
- Monitoring risks & issues and intervening where appropriate.

Task 3.2 Increase the energy efficiency (Lead: UME; Partners: -) [M1-M60]

To push the European smart cities agenda, an overall power efficiency goal has been set for the innovation area, as part of the project development process. The goal is no net increase the total power output, despite the continued substantial increase in square meters of buildings, and growing number of people and businesses using the innovation area. This is a challenge, but achievable through smart solutions and new and innovative cooperation and business models between the main actors; energy company, property owners, building managers, builders, but also city, the tenants and the work place employees in the area.

Electricity is a commodity that becomes more and more important every day, there are ever-increasing demands on the availability of electricity (delivery and quality) as well as an interference-free electricity (power quality). Today's challenges in the electrical environment include both new energy produced locally, as well as additional electrical devices in both home and industrial environment. These devices increase the need for a continuous and accurate monitoring of electricity consumed. Each occurrence of malfunction creates an impaired delivery and power quality and thus increasing cost. Energy optimization includes both control of the amount of energy and the energy losses and their cause. To complement energy metering with power quality measurements provides a basis to show the cause of the energy loss, and then be able to decide on the most cost-effective measures in every load point.

Drivers:

- The need to prepare for future demands on the power market, both from changing customer demands, but also changes in the legislation around power distribution.

- RUGGEDISED will help to bring insight and good knowledge to handle these changes in the best way.

- Better customer service with monitoring, failure prevention strategies, power quality analyses and helpdesk to improve customer power quality.

- Better monitoring of the power grid, automatic alert functions for superior operation.

- Better control of down periods.

- Lowered grid losses due to improved power quality. (coming from the actions based on knowledge obtained by this project)

SMART SOLUTION U1 - Smart City connection to 100% renewable energy (Smart Solution Leader: UEAB) [M1-M36]

Demonstrate business model to add value of shared energy solutions, to optimize PV/solar energy production and battery storage, possibilities for control and optimization based on a smart grid concept. A challenge is the quality issues and optimization from an overall perspective, how could we further develop the monitoring, power quality, prevent disruptions etc. All actors have to be involved in the process of optimization in a cooperative manner.

Actions include an analysis of peak load and energy durations at an aggregated level of the district, define and establish optimization boundaries for top load shaving, energy optimization and more.

We will establish a business model testbed: Identify value proposition, cash flow, Stake holder dependencies, risk mitigation and more. This will be monitored and measured for evaluation and conclusions.

Note: Integrating large numbers of electric vehicles as well as RES into the grid will doubtlessly have an impact on the grid itself. The challenge that UME takes on is to realise a connection with a substantial amount of electric vehicles to the grid, as well as to feed this grid as much as possible with alternative energy sources. The commissioning of electric vehicles (mainly public transport) through the use of appropriate software (and data), will be the focus during the project. The impact will be described and analyzed thoroughly.

SMART SOLUTION U2 - Peak load variation management and peak power Control (Smart Solution Leader: UEAB; Partners: AHAB, VCC) [M1-M36]

By using the buildings as thermal energy storage it is possible to even out peak load variations of the buildings, whose structure itself functions as an accumulator of heat energy. Depending on the composition of the structure of buildings, more or less heat can be stored and used for "load shaving". Within this solution, additional monitoring (sensors) and energy management units will be installed in the buildings and programmed according to the building physics, weather conditions, tenant activities and other parameters. The energy management units are also configured to communicate with other buildings in an open network cluster where a web-based information platform will be developed and results shared for benchmarking purposes. The information platform will involve parts of the campus area, the hospital and the students' apartments. In terms of impact, this measure can guarantee a reduction in energy consumption for heating of

about 2-8%, depending on building physics and the type of activities of tenants (living, health services, trade, academia, etc.).

Campus Umeå houses 265 000 m²premises and room types vary from dry office and teaching facilities to the energyintensive wet labs and computer rooms. Total heating power is the need today, 12 hour average, 11 MW of which 1.5 MW is produced by heat pumps. The power requirement of the district heating network is approximately 9.5 MW. Power costs money to produce but also in the form of capital for production. Above all, a high power demand of high CO2 load because Umeå Energi peak production consists of oil. In a sustainable society, it becomes increasingly important that the power demand evened out throughout the day so that condensations can be made in the existing network with the existing production capacity and shift to more renewable energy sources will be easier to implement. Manual tests have shown that the peak power required at Umeå Campus can be reduced 15% with smart controls. Then, in order to save money in the form of reduced power section in the district subscription. In the project, a review and analysis of what is feasible as well as programming and testing of automatic features so that this can occur when certain conditions exist. Expected to reduction of the power requirement of at least 20%.

Examples of elaborate measures:

- Download buildings with heat during time of low effect

- Lower the air flow in the ventilation systems where it is possible.
- Lower heat supply during certain times of the day.

- Increase the production of heat pumps at certain times.

- Study effects of energy storage in the ground.
- Control With the weather forecast so that one step ahead where it is required.

The projects also includes the study of real environmental benefit by looking at the consequences production hour by hour at Umeå Energi and match it to the power demand on campus. Today, measured subscribed power as the highest average power of 0600-1800 or 1800-0600. By comparing the power peaks in the district heating network, hour by hour, greater savings effects and power reduction can be activated on more occasions during one year.

The existing peak power control platform has been successfully tested on a smaller scale for a number of years and Umeå domain experts have had good experiences with the technology applied. Tests with manual control simulating the automated energy management have also shown that the peak power demand at Umeå Campus can be reduced at least 15 % with smart energy management. Using automated power controls with ICT tools will be even more effectively implemented in the University and residential buildings, thus leading to less fossil fuel consumption during peak load time. Approximately 1 % of total energy in the district heating is today fossil fuels, used at extreme temperatures and other extreme peak loads.

SMART SOLUTION U3 - Geothermal heating/cooling storage (Smart Solution Leader: VCC; Partners: UEAB, AHAB) [M1-M36]

Business model(s) for sharing of a new geothermal heating/cooling storage in the area will be tested in order to secure the delivery of heat and cold during the extreme variations of climate/temperature of the four seasons in Umea (+30C to -30C). One operation may have an excess of heat/cold when the other is in need of it. The underground storage could be loaded from all operations/buildings and used by all when needed. The advantage is that that the need for heating and cooling vary as different buildings in the innovation area operate at different times during the day and also during the year. The impact of this is both energy and maximum power savings and includes a business model that builds on sharing economy instead of the traditional ownership of the production. Activities will include the mapping of the exchange of heat & cold and to identify how the small scale production in the area could integrate and the large scale production of local district heating grid, in order to achieve the most effective and efficient outcome for the whole district/city.

The starting point for developing a business model is that VCC has to make available their land and the geothermal storage to the business of the energy company (UEAB), without a money lease. AHAB, UU and VCC need to share their surplus of heat and cold to the UE. In return the energy company should provide the tenants and the estate owners (AHAB, UU, VCC) of the energy they have stored, possible from the grid, but it ought to be at a very low price, or no price at all - depending on the business model developed. In a longer term other actors, such as private home owners may be included in the cooperation. Legal issues need to be clarifies between all parties and the terms of contracts for this business cooperation is to be worked out. The existing legal business model between land owner and energy company is not suited for this kind of cooperation. A new way of thinking has to be developed - in the end it is more a form of cooperation where all are winners - meaning that on the one side no financial flows should be involved but on the other side the ownership rights are not touched and the control over Geothermal storage facilities could be handed over the energy company. The advantage of this business model, particular between VCC an UEAB, is that the investment costs for upscaling to other areas is very low as the geothermal storages are in place in many places within the ownership of VCC and also where UEAB is the owner of the grid.

SMART SOLUTION U4 - Intelligent building control and end user involvement (Smart Solution Leader: AHAB; Partners, UME, UEAB, UU) [M1-M36]

An intelligent and integrated control system for the internal climate will be installed in new apartment buildings (Lilljansberget) in the university city demonstration area, with the potential to allow for the continuous analysis of energy performance as well. By modifying ICT suited for commercial buildings, in private homes, the purpose of this action is to involve private homes in the improved energy performance of the whole area. The energy consumption attributable to end users makes up about 50-70% of the total energy usage in a building. The integrated control system will enable exploring how incentives can make the tenant choose to put their flat in "home or away- mode". As the flats are mainly student flats and guest scientist homes, the "away-mode" would at times be long-term and the potential for savings large. Sensors will be installed in order to better measure the outdoor climate in combination with the internal activity of the building, allowing the optimisation of the indoor climate depending on the weather, thus reducing energy use. An analysis tool in the building monitoring system is aided by sensors in building and HVAC systems to evaluate current status in relation to perceived optimum. An implemented system enables fast building energy status appraisals. With this experience, a model for end-user involvement at workplaces will also be tested, well aware of the constraint that it is difficult to find direct incentives as the action does not directly affect the end user.

In addition Akademisk Hus AB will install automatic smart control equipment to control air volumes, room climate and lighting for the presence and needs of 130 offices at the University area. The rooms connected to a parent monitoring where settings can be made and the current status reported and stored. This action will reduce heating demand, electricity use for fans and lighting and better room control resulting in better climate for the workers.

Task 3.3 Integration of E-Mobility (UME) [M1-M60]

Today, an average of one diesel bus every minute passes through the innovation area. The city of Umeå has been testing fully-electric ultrafast chargeable articulated buses developed by a European industrial consortium and coordinated by Umeå-based company Hybricon. Charging with ultrafast technology enables the buses to be charged in the terminus and go on electricity during the route. During the project a total of 33 fully-electric buses will be servicing the area, and fast-charged at the bus-line end-stops, financed separately from this proposal.

As mentioned earlier, integrating large numbers of electric vehicles as well as RES into the grid will doubtlessly have an impact on the grid itself. The commissioning of electric vehicles (mainly public transport) through the use of appropriate software (and data), will be the focus during the project. The impact will be described and analyzed thoroughly.

SMART SOLUTION U5 - Energy optimised electric BRT-station (Smart Solution Leader: UME; Partners: AHAB, UEAB, UU, UPAB) [M1-M36]

The demonstrated electric buses are designed to operate in the cold climate of northern Europe, but a challenge is the heat and energy loss during the boarding procedures and the bus needs to be heated inside. In order to handle the heat loss, consequently and ensure range capabilities, every time the bus stops to let people in and out in the busy innovation area, a new electric "Bus rapid transit station" hub will be developed within the campus area. These will be provided with shelters, heating systems, an intelligent ticket identification system using smartphones before boarding and an insulation structure to minimize energy loss from the boarding procedures. A new partnership will be formed for this business case to happen, as the area where the bus needs to pass and stop, has two different land owners (VCC & AH) and another owner of the road (UME).

SMART SOLUTION U6 - E-charging infrastructure hub (e-bike, private car, taxi, car-share (Smart Solution Leader: AHAB, Partners: UEAB, UPAB, UME, VCC) [M1-M36]

E-charging facilities will be essential to ensure the roll out of electric vehicles in the area. A charging hub for e-vehicles will be tested, with charging facilities for e-bikes, e-cars and car-share. By installing PV plants along with energy storage, advanced monitoring and governing systems and charging points of electric vehicles within the innovation area, good results will be gained in terms of reducing building energy consumption, as well as systemic effects such as decreasing peak loads. Different batteries and storage solutions will be tested within the project. One example is that the area holds of a large number of work place parking spaces and every parking has an electric engine-preheater that all starts running around 3 pm, a few hours before people are planning to leave work – and the power system is already under strain at these hours. Additional E-vehicle charging adds strain to the system. Therefore a smart power control management-system, including a dynamic payment system for the charging, will be tested. We will also seek to explore how this small-scale PVs can integrate with the overall system in the best way and how the battery storage can be up scaled.

SMART SOLUTION U7 - Energy-efficient land use through flexible green parking pay off (Smart Solution Leader: UPAB, Partners: AHAB,UME) [M1-M36]

The activity will focus on implementing a new business model in the campus/university city area, enabling a reduction of car parking spaces and directing developer investments from parking towards sustainable mobility solutions (e-car sharing, e-buses, e-cycling etc), thus reducing the climate impact and overall energy use. The business model will be an extended version of the Green Parking Pay-Off model that has been developed for commercial buildings in Umea, and will now be applied to residential buildings as well. The evaluation model designed for a pilot study indicates a 41% potential for modal change from car to car sharing, public transport, cycling or walking, when all the foreseen sustainable mobility measures are implemented. According to the evaluation model, similar energy savings on fossil fuels (40+ %) is expected from the introduction of this new business model. This will be enhanced by the integration to the Smart Open Data Infrastructure (T2.4). Some of the data collection needs to be complemented by traffic and movement sensors that will be analysed to monitor the progress – but also processed into information services (by web & app) for people living-, working- or visiting in the area. A multi-storey car park will be built during the project and the planning for this (and later two other) will build on the results from this solution. As part of the Pay-off model, the property builders will invest in for example E-car chargers and E-car share system for the new residential areas.

T3.4 Enabling low-carbon ICT solutions/infrastructure (UME) [M1-M60]

SMART SOLUTION U8 - Smart Open Data city Decision platform (Co-creative design platform) (Smart Solution Leader: UME) [M1-M36]

The solution aims at the integration of existing and new ICT solutions into a Smart City Data infrastructure based on Open Data principles, and connection to a City Decision Support platform. Smart Cities have a strong dependence on data. At present, strategic data is locked-in in different operational systems making it hard to reuse. Hence, the more data that becomes available, the easier it will be to integrate it with other data. Moreover, the more predictable the business logic is for the re-user, the more smart innovations will see the light of day. This will be achieved by the Smart City Data infrastructure, see above for Umeå's proposed scheme. To systemize the collection of data information, we will integrate existing and new ICT solutions into a Smart City Data infrastructure based on Open Data principles, and connection to a City Decision Support platform. The infrastructure will provide data of the city's energy consumption, energy production, buildings and technologies involved and human behaviours, complemented by non-technical artefacts such as business models, support processes etc.

The local lighthouse partners collect huge amounts of information and data, for example on buildings energy performance, land use, planning, human behaviour etc. Separately from each other they are used for smaller improvements of energy performance etc, but integrated with each other they have huge potential to improve energy savings through collaboration and knowledge, cost etc. on a district- and city level, as an input into urban planning and co-creation processes. Some of the data are collected and some are missing so there is also a need to set up new sensors for the missing data to be connected to the innovation area. A challenge is that in Sweden, people are not used to the concept of open data in the urban context and there is a public discussion going on about personal integrity issues around open data. The project will arrange discussion forums and workshops for citizen involvement in order to overcome these general public barriers. We believe that by not only making the data open, but also make it understandable and user friendly to the public through web and mobile applications as smart city services to the community, in practice these barriers will loosen up. People's need to access the data, as well as automatic integration and interpretation (for machines/PCs) based on the meaning/definition of the data created with different semantic techniques, will also be considered in the infrastructure's design

This is an area in which the city of Umeå believes we need to move forward with caution. Open Data is not something that is commonly accepted. There may be worries that some data could be used in for example in criminal purpose. There is also a lot of debate about the personal integrity if you publish data on homes energy use. This worry is something that we will attempt to overcome by dialog and information. The next step is to start release a few examples on how open data can be practically useful for the public or tenants in the innovation area or for different departments in the city administration. The city of Umeå will work together with a contractor to create the platform. All partners need to collect their data and publish it. AHAB, VCC and UM needs to work out witch data they need to take steps towards the energy savings. App and/or web publication of data for the public to simple use for the public will be developed by the city (with the help of a contractor)

SMART SOLUTION U9 - Demand-side management (Smart Solution leader UU) [M1-M36]

Floor space drives energy use, and is thus a strategic decision-making criteria in area management. Umeå University with its 250 000 m2 of floor space, will test multivariate analysis tools for predictive analytics which will support the decision process concerning tenant area use is the most powerful way to reduce energy consumption by the end user. Facility services adaption trough predictive analytics derived from the flow of students connections to the wireless net. Facility services such as cleaning of floors, technical standby and waste management traditionally operates on schedules

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and contracts. By studying flow of people through connections to the wireless system and validating data by behavioural and informatics studies the adaptive possibilities increase enormously. If we can predict and adapt the services to actual behaviours and/or manage behaviour we can lower energy consumption the hours when facilities are off-peak. The University will work together with a contractor to set up the Smart monitoring system and the area manager will develop the tool for maintenance and power control. One challenge is to be able to meet the growing number of students and scientists, thus the need for more area space in the University, without building new buildings and therefore increasing the need for energy. Caution have to be taken in order to avoid the solution becoming a surveillance activity only the flow of groups of people will monitored and the students will be involved.

Task 3.5 Smart city services to the community (UME) [M1-M60]

Citizens involvement for more sustainable residential neighbourhoods

To create a sustainable and pleasant (safe and secure) housing environment for the residents it is important to integrate several perspectives in communication actions and citizens involvement. The main objective with the communication is to make the residents care for their neighbourhood and make green behaviour the new norm when it comes to travels, energy use, littering, recycling etc. The aim is to measure this individually and create incentives for people to save energy, travel sustainable and recycle waste. New interactive communicating methods for example innovative demonstrators and mobile applications will be developed, based on open data and supplementary information. To reach the whole potential it is important that the tenants receive relevant complementary information on how to be environmentally friendly in their own neighbourhood.

Residents can apply to be sustainable ambassadors for the neighbourhood, the ambassadors will have recurrent meetings with sustainable experts from the city to discuss sustainable improvements in the area. The ambassadors can also arrange own actions together with the residents like bike service day, swap days etc.

The city of Umeå will evaluate the impact of different communication methods combined with existing or non-existing technical installation of interactive displays contributes to the overall energy efficiency of the residential area in the real life environment, and whether this represents a cost beneficial effort on a larger scale in the city.

The residents behaviour is often neglected when it comes to calculating energy use in new low energy houses, results from monitoring low energy houses shows that the energy use in similar buildings can differ depending on how aware the residents are on energy savings. Specifically educated Smart energy guides will be visiting households in the area and explaining methods for energy saving (including waste, transport, water etc) suited for their home and life situation. The households are getting a survey of their energy consumption by the Smart energy guide, based on Open data and supplementary information. The survey is summarized in a written report to each household. They are also demonstrating the function of the displays and demonstrators to assure that as many people as possible are using them the correct way. An information centre will be realised where citizens, businesses, officials, academics etc. can receive an introduction to the demonstration area.

Task 3.6 Activating the local innovation system (Lead: UME; Partners: -) [M1-M36]

This task will look at how citizens of the project district can be engaged throughout the delivery of the project in the district to ensure that the interventions provide them with tangible benefits. The city of Umeå (Energy counselling office), together with local partners (primarily property owners/tenants associations etc) will work with Energy Guides/ Advocates to ensure communication links with the citizens in the district. An innovation center will open its doors to citizens and businesses with information about the project. A "Venture Café" where stakeholders (citizens, businesses, entrepreneurs, authorities, etc.) can interact about challenges and smart sustainable solutions in (the districts of) the city will be set up (weekly or monthly gatherings).

In addition, open data (and solutions based on these) will be used to keep citizens informed through the Umeå City Decision support platform.

Regional up-scaling of solutions.

The partners of Lighthouse Umeå are all part of a formalised network called "Network for sustainable construction and management in cold climate". It is a prominent and established network that was formed in Umeå in 2009, and consists of companies, organizations and government agencies that each one belongs to the link in the construction chain. The members of the network are together in an ongoing process contributing to all planning, construction and management in Umeå and the region. The network members aim to constantly improve and develop in a sustainable way for the benefit of people, society and the environment. The network will enable the dissemination and initiate the upscaling of the Light house solutions and will also get valuable input to the ongoing project. Another regional initiative of relevance is the European Innovation Partnership for the NSPA region in northern Europe.

To increase impact Umeå will also develop a Smart City Implementation Package containing all information necessary to allow for replication in a wider community of EU-cities.

To maximise the potential for other cities to replicate the solutions being implemented, a detailed Implementation Report will be produced for each city (to be updated twice after its first delivery in M36). This will follow a project template established in WP1. The individual solution Implementation Reports will be combined within WP1 into a Lighthouse City Implementation Report.

Participation per Partner

Partner number and short name	WP3 effort
2 - UME	60.00
4 - SP	10.00
8 - ICLEI	3.00
10 - UU	28.00
20 - AHAB	25.00
21 - VCC	30.00
22 - UEAB	35.00
23 - UPAB	16.00
Total	207.00

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D3.1	Business Model proving investments on sustainable mobility solutions (reduce parking spaces to stimulate e- car sharing, e-buses, e- cycling)(1/2)	23 - UPAB	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D3.2	Business Model proving connection to 100% renewable energy	22 - UEAB	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D3.3	Business Model proving sharing of geothermal heating/cooling storage	21 - VCC	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D3.4	Implementation Report Umeå (1/3)	2 - UME	Report	Public	36
D3.5	City Decision Support platform ready	2 - UME	Other	Public	40

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷	
D3.6	Automatic smart control units (for room climate and lighting) installed in approx. 130 offices	20 - AHAB	Other	Public	40	
D3.7	Web based information platform for energy management	22 - UEAB	Other	Public	40	
D3.8	Concept "Bus rapid transit station" installed in campus area (New shelter, heating systems, intelligent tickets identification)	2 - UME	Other	Public	42	
D3.9	E-charging facilities for e-vehicles installed in Umeå	20 - AHAB	Other	Public	42	
D3.10	Analysis tools on energy consumption implemented on campus (to support demand-side management)	10 - UU	Other	Public	42	
D3.11	Implementation Report Umeå (2/3)	2 - UME	Report	Public	48	
D3.12	Implementation Report Umeå (3/3)	2 - UME	Report	Public	60	

Description of deliverables

D3.1 : Business Model proving investments on sustainable mobility solutions (reduce parking spaces to stimulate ecar sharing, e-buses, e-cycling)(1/2) [30]

Task U7: A signed business agreement between AHAB, UME and UPAB. Including a description of the measures UPAB and AHAB are performing in order to increase the level of sustainable transports. Also including a follow up plan.

D3.2 : Business Model proving connection to 100% renewable energy [36]

Task U1: A written report/business agreement with a description of the status of each actors current status of their energy source. Also including a plan/checklist of the steps they need to take before the whole area becomes 100% renewable regarding the energy scouse. The partner signature on the business agreement.

D3.3 : Business Model proving sharing of geothermal heating/cooling storage [36]

Task U3: A written report /business agreement with a description of the of each actors status regarding their contribution to the storage and how it will be used. Also including a plan for how other geothermal/cooling storages in the region will be used. The partner signature on the business agreement.

D3.4 : Implementation Report Umeå (1/3) [36]

To facilitate the replication of the RUGGEDISED solutions within the Follower Cities and beyond a detailed Implementation Report from each Lighthouse City on the solutions implemented. These will be aimed at providing relevant information to inform and facilitate the potential replication of the solutions identified in other cities. They will contain: 1. Background/context - Key targets, policies and other implementation drivers and framework

conditions 2. The integrated smart city framework developed and applied within the project 3. Detailed descriptions of each solution applied, covering (precise aspects covered may vary according to the nature of the solution being described): - Technical implementation details - Process descriptions presenting the different stages of the planning, procurement, implementation and monitoring process - Business and contractual models applied - Integration with other solutions applied - Relevant citizen/end user engagement activities 4. Results – Detailed information on the overall impacts of the implemented measures, together with individual results per solution where relevant - Impact – on Energy efficiency, environmental performance, quality of life and social value - Economic assessment – Quantified information on the economic impact of the measures implemented, in terms of costs for the public authorities involved, business cases for the private partners and investors, and impact on job creation and wider economic development - Replication assessment – An initial assessment of the extent to which the technical solutions and the business/contractual models implemented in the Lighthouse Cities, may be replicated in other European cities The Reports will be produced by the Lighthouse Cities based on a template provided by ICLEI.

D3.5 : City Decision Support platform ready [40]

Task U8: A link or/and a screenshot of the City Decision Support platform with a description of the improvements it has led to. This is to show that the platform is complete and used by the city administration.

D3.6 : Automatic smart control units (for room climate and lighting) installed in approx. 130 offices [40]

Task U4B: Blueprint describing the result of the Automatic smart control units result on the energy including photos of the installations. This is to show that the installation is complete and used in the office buildings.

D3.7 : Web based information platform for energy management [40]

Task U2: A link or/and a screenshot of the platform including a systems analysis map. This is to show that the platform is completed and the improvements are working.

D3.8 : Concept "Bus rapid transit station" installed in campus area (New shelter, heating systems, intelligent tickets identification) [42]

Task U5: Digital blueprint describing the BRT-station, including travel statistics and photos of the design and building phase and the completed result. This is to show that the construction is complete and used in the area.

D3.9 : E-charging facilities for e-vehicles installed in Umeå [42]

Task U6: Digital blueprint describing the E-charging facility, including travel statistics and photos of the design and building phase and the completed result. This is to show that the construction and installations are completed.

D3.10 : Analysis tools on energy consumption implemented on campus (to support demand-side management) [42] Task U9: A link or/and a screenshot of the Analysis Tool with a description of the improvements and changes in working methods that it has led to. This is to show that the implementation is completed.

D3.11 : Implementation Report Umeå (2/3) [48]

To facilitate the replication of the RUGGEDISED solutions within the Follower Cities and beyond a detailed Implementation Report from each Lighthouse City on the solutions implemented. These will be aimed at providing relevant information to inform and facilitate the potential replication of the solutions identified in other cities. They will contain: 1. Background/context – Key targets, policies and other implementation drivers and framework conditions 2. The integrated smart city framework developed and applied within the project 3. Detailed descriptions of each solution applied, covering (precise aspects covered may vary according to the nature of the solution being described): - Technical implementation details - Process descriptions presenting the different stages of the planning, procurement, implementation and monitoring process - Business and contractual models applied - Integration with other solutions applied - Relevant citizen/end user engagement activities 4. Results - Detailed information on the overall impacts of the implemented measures, together with individual results per solution where relevant -Impact – on Energy efficiency, environmental performance, quality of life and social value - Economic assessment - Quantified information on the economic impact of the measures implemented, in terms of costs for the public authorities involved, business cases for the private partners and investors, and impact on job creation and wider economic development - Replication assessment - An initial assessment of the extent to which the technical solutions and the business/contractual models implemented in the Lighthouse Cities, may be replicated in other European cities The Reports will be produced by the Lighthouse Cities based on a template provided by ICLEI.

D3.12 : Implementation Report Umeå (3/3) [60]

To facilitate the replication of the RUGGEDISED solutions within the Follower Cities and beyond a detailed Implementation Report from each Lighthouse City on the solutions implemented. These will be aimed at providing relevant information to inform and facilitate the potential replication of the solutions identified in other cities. They will contain: 1. Background/context – Key targets, policies and other implementation drivers and framework conditions 2. The integrated smart city framework developed and applied within the project 3. Detailed descriptions of each solution applied, covering (precise aspects covered may vary according to the nature of the solution being described): - Technical implementation details - Process descriptions presenting the different stages of the planning, procurement, implementation and monitoring process - Business and contractual models applied - Integration with other solutions applied - Relevant citizen/end user engagement activities 4. Results – Detailed information on the overall impacts of the implemented measures, together with individual results per solution where relevant - Impact – on Energy efficiency, environmental performance, quality of life and social value - Economic assessment – Quantified information on the economic impact of the measures implemented, in terms of costs for the public authorities involved, business cases for the private partners and investors, and impact on job creation and wider economic development - Replication assessment – An initial assessment of the extent to which the technical solutions and the business/contractual models implemented in the Lighthouse Cities, may be replicated in other European cities The Reports will be produced by the Lighthouse Cities based on a template provided by ICLEI.

Schedule of relevant Milestones

Work package number ⁹	WP4	Lead beneficiary ¹⁰	3 - GCC
Work package title	Challenges an	d Solutions in Glasgow	
Start month	1	End month	60

Objectives

The main objective is to develop, implement and monitor smart city demonstrations on Glasgow's Smart Street. The Smart Street connects Glasgow's city centre to the East End of the city and is connected to a number of regeneration programmes in city. The specific objectives of this work package are to:

- - Decrease carbon dioxide emissions from the generation of heat and power by over 2,700tCO2 per annum from combined heat & power engines, and renewable energy generating assets.

- Increase electric vehicle charging infrastructure in the district from 4 fast charge and 1 rapid charging posts to 12 fast and 5 rapid over three years, thus facilitating an increase in electric vehicles in the district, significantly improving air quality and reducing transport related CO2 emissions.

- Increase the amount of buildings and assets connect to demand-side management technology from 4 to in excess of 20 to demonstrate that electric vehicle charging, intelligent street lighting and other such controllable loads (buildings, etc.) can be incorporated into a demand-side management system, utilising the street lighting Central Management System and associated network to facilitate connection of these smart controllable 'devices' across the city.

- To create a truly Smart Grid with enhanced control of electrical assets in the district and working with the local electrical network operator.

- To create business models that enable local generators and consumers to contract with each other for the purchase and sale of heat & power.

- Develop an analytics engine to inform the up-scaled deployment of the solutions implemented through this work package.

Description of work and role of partners

WP4 - Challenges and Solutions in Glasgow [Months: 1-60] GCC, ICLEI, US, TS, SPPS, TCB, SIE, WG

Task 4.1 Coordination and management of the lighthouse activities (Lead: GCC) [M1–M36 / M37-M60]

Glasgow City Council will establish a smart city governing group in the form of a Programme Management Office (PMO) to oversee delivery of its commitments within the Horizon 2020 project. The PMO will including a Chief Productivity Officer (CPO) in the district that identifies opportunities and supports the collation of views of the affected stakeholders. Key tasks will include (but not be limited to):

- Developing and managing project plans to ensure that local activities are delivered on time and to cost.
- Coordinating the work of local partners in line with project plans.

- Identification and management of risks & issues and escalating where necessary.

- Managing project performance, including collation of required governance paperwork and reporting on local activities in respect of financial, legal, procurement and operational reporting conditions.

- Ensuring compliance with Horizon 2020 financial conditions of grant and providing compliance information to WP10.
- Quality monitoring and enforcement of standards as required from Horizon 2020.
- Ensuring that all of the city's commitments to other vertical and horizontal work packages are delivered.

- Representing the local project externally and acting as the main point for communications in support of delivery of WP9 - Liaising regularly with the central urban planning department in the city in order to gradually integrate urban planning with the other pillars (mobility, energy, ICT). During the project, the precise connection will be explained on the basis of the progress of the project and integration will take form.

Note: the CPO's role is to be aware of the urban demand which he will put central in his quest to exploit opportunities, and the cities' activities as defined in this Work Package will thus be leading and shall be translated into business models. This aspect will have the CPO's focus during the project

The PMO will also support a Project Steering Group for Glasgow which will bring together partners to oversee and monitor the delivery of local plans and as well as the city's commitments to other vertical and horizontal work packages. The Steering Group will meet on a regular basis for the duration of the Horizon 2020 project. Tasks will include (but not be limited to):

- Setting strategic direction for local project activities.
- Monitoring progress, including project milestones and deliverables against objectives.
- Change control and approval of variations.
- Monitoring compliance and intervening where necessary.
- Monitoring financial spend and ensuring timescales are met.
- Monitoring risks & issues and intervening where appropriate.

Task 4.2 Increase the energy efficiency at the district level (Lead: GCC; Partners: US, TCB, WG) [M1–M36]

The project district contains a diverse collection of buildings, ranging from the very old - Glasgow City Chambers was built in 1888 - to the very modern - The state-of-the-art Technology and Innovation Centre was built in 2014, and provides a range of usage types, from domestic and academic to industrial and commercial and a range of utility provision infrastructures. This task will leverage the local construction of district heating networks by private and academic institutions to enhance the availability of low cost and low carbon heat, and where possible power, to public sector and tenants of Registered Social Landlords (RSL) in the project district. By understanding the generation and consumption profiles of the relevant buildings in the project district, through the utilisation of smart meter data, RUGGEDISED will seek to establish the appropriate business model that will facilitate the connection of buildings near to those district heating networks being constructed in the district. These business models will examine the potential to utilise a public sector ESCo as an intermediary and to understand the benefits this model would produce over a straight transaction between the generator and consumer.

Smart Solution G1: Heat and Cold exchange - Connection of buildings to district heating network

A. Business models facilitating the connection of University of Strathclyde (Lead: US) to the City Chambers Complex (CCC).

The US is in the process of developing a district heating network for its entire campus. The US have issued a tender for the construction of their £16 million (22 M€) energy centre and district heating network, funded through a combination of US internal funding and Scottish Funding Council monies. There is a willingness from both the US and GCC, both of whom are key members of the Sustainable Glasgow Partnership, the city's key partnership for delivering on its ambition of becoming one of Europe's most sustainable cities, to connect the CCC to the network, retaining the boiler plant in the CCC as backup to the district heating network.

The technical challenge of connecting the US and CCC will be undertaken and funded from separate sources, however the work required to establish the transacting model between the parties has not been established. Creation of a business model that serves to provide benefit to both public sector parties will be highly valuable to the city and others like it throughout the United Kingdom and EU.

The energy centre, which will use gas-fired combined heat & power engines, is located near to the CCC (illustrated in figure above), which are the council's flagship buildings and corporate headquarters. Currently, the CCC is heated via gas boilers, therefore, connecting to the CHP-fed district heating network will enhance the energy efficiency of the buildings in the complex, which in turn will reduce associated CO2 emissions.

In addition to the increased efficiency delivered to the Council through the connection to the district heating network, the heating profile of the CCC will enhance the efficiency of the US energy centre by increasing the heat base-load, thus providing financial and carbon benefits to the US.

B. Business models facilitating the connection of Tennents Caledonian Brewery to WG

The Tennents Caledonian Brewery (TCB) is developing an energy centre that will provide the electricity and heat required for brewery operation and brewing processes. It is the ambition of TCB to provide any surplus heat to a local housing association district (Drygate) owned by the Wheatley Group (WG) near to the brewery building.

The local housing district includes high and medium rise apartments that use electrical heating systems and the area is known to have a high incidence of fuel poverty, which means that individuals or families have to spend more than 10% of their available income on utilities. The properties in this area have already benefitted from improved insulation to increase their energy efficiency, however they remain heated by expensive and inefficient electrical heating systems. Due to the Ronan Point disaster (https://en.wikipedia.org/wiki/Ronan_Point), individual gas boilers are no longer installed in high or medium rise apartment blocks, therefore, district heating presents a viable means to further enhance the energy efficiency of the properties at relatively lower costs, helping to alleviate fuel poverty.

The project will develop a business model for the connection of the TCB to the Drygate housing, which is aligned to a not-for-profit ethos and promotes the investment of any surplus revenues generated into energy projects. There is an emerging requirement for the Wheatley Group to provide backup to this connection in the event the CHP is not

running, and the technical and financial ramifications of this requirement will be investigated, including the possibility of providing backup via a supplementary connection to the University of Strathclyde DH network or a source of renewable heat such as biomass or geothermal heat, creating a larger and more resilient network in this strategic city centre location.

ST 4.2.1 – Verification of effectiveness of DH connections to GCC & WG

The Energy Systems Research Unit (ESRU) at the University of Strathclyde will be involved in the deployment of environmental condition sensors in the CCC and a selection of WG domestic properties, to monitor the impact of switching from conventional heating systems to DH by monitoring the in-situ environmental conditions within each of the buildings. This data will be combined with metered consumption information to ensure that any changes in environmental conditions can be tied to changes in consumption patterns. The sensors will be deployed before and after the DH switch, so that valid comparisons can be made.

This follows on from work carried out as part of the Innovate UK Future Cities Demonstrator Project, during which the University deployed a number of sensors in 60 domestic properties across Glasgow to assess the impact of retrofitting insulation onto buildings. The sensors will measure conditions such as temperature and humidity levels within the buildings and the data will be fed back to a central database, via the Council's Intelligent Street Lighting Central Management System (ISL CMS), which both allows centralised control of the lighting levels of LED lighting across the city and harvests data from these LEDS (consumption, power factor, etc) as well as other smart nodes connected to it such as sensors and other smart city-type devices.

ESRU will also work with the Wheatley Group to assess the impact of the change in heating system on fuel poverty and will also seek to understand a range of additional applications, such as TeleHealth, that are possible through the ISL CMS.

The cumulative impact of connecting the aforementioned buildings to district heating networks is a total reduction of CO2 emission of 2,113tCO2.

Optimising Energy Storage in the project district (Lead: GCC) [M1 – M36]

This task will identify and develop, via an understanding of the renewable energy generation and EV charging infrastructure deployment in the project district, a suitable battery & battery/grid interface controller for deployment in the district in order to simultaneously: maximise local use of generation from renewable and low carbon sources through more efficient energy transfer and, potentially, arbitrage services; assist with the rapid charging of EVs, acting as a buffer between the charging and network; and provide ancillary services to the electrical network such as grid balancing. The Lithium-ion battery will be sized at around at 500kW and will provide sufficient power output and energy storage capacity for the application intended.

Smart Solution G2: Deployment of a suitable battery storage technology in the project district (Lead: SIE/GCC) [M1 – M36]

A. The development of an electric vehicle parking hub, utilising space within an existing multi storey car park in the city (Duke Street) will incorporate innovative solar PV canopies, creating renewable energy for the charging of the electric vehicles. When demand for charging is low, the power generated by the solar canopies will be stored in batteries for later use. The aspiration is to minimise the amount of energy being fed back into the local electricity grid and ensure that power generated is either consumed immediately or stored locally for consumption when demand is high or local generation is low. There exists potential to use the battery for grid support, and the project will further explore the extent of the grid balancing opportunity in relation to the connected assets and the existing electrical grid infrastructure. The technical challenge of integrating this storage infrastructure into an existing car park and the financial benefit this can bring will be assessed, with the ultimate goal of up-scaled deployment across the city to similar multi-storey car parks. To add strength to the case for up-scaling of the EV Charging Hub, RUGGEDISED will seek to explore a business model in collaboration with project partners Transport Scotland (TS) to promote the future uptake of electric taxi's in the city through access to rapid charging infrastructure. Opportunities to expand this beyond the project district have already been identified which would further support wider roll-out of electric taxi's.[font]

B. Supply of RES to EV charging and battery infrastructure GCC/TS/SIE

Technical challenge in establishing the optimal flow of power either directly from PV to EV chargers, or via the battery to the EV charger / electrical network. Organisational challenge in identifying the business model for involved parties, i.e. owner car park/supplier battery storage system. The selection and design of storage solution will be done in partnership with Siemens, thus ensuring the most appropriate technology is deployed to best align with the generation profile(s) of connected asset(s), such as CHP or renewables, as well as being capable of operating as part of a grid balancing system in a Smart Grid scenario. The solution will be modular for up-scaled deployment and replication.

Smart Solution G3:TCB CHP surplus power storage in EV Charging hub battery storage

In addition to the storage of electricity generated by the solar canopies, the potential to store surplus electricity from the neighbouring TCB energy centre exists and the project will look at the detailed feasibility of doing so in addition to the technical and financial project development required by TCB. The technical and financial arrangements that will allow this local transfer of power will be identified, along with the financial benefits it would bring and the regulatory hurdles that may need to be overcome.

ST 4.2.2 Integration of battery storage technology in dynamic energy network

In order to maximise the utility of the battery installed at Duke Street Car Park, there is a requirement to understand its role in demand-side management and grid balancing. Working with the local distribution network operator, SPPS and Siemens will identify the technical challenges of integrating battery storage with the grid, as well as exploring the business models that will facilitate the optimal use of battery storage in an urban Smart Grid scenario.

Smart Solution G4: Optimisation of the integration of near-site RES, potentially liked into battery storage Integration of Renewable Energy Sources GCC M1 – M24

This task seeks to significantly increase the deployment of suitable renewable energy sources in the project district and ensure that as much of the renewable energy generated is used locally within the district thus ensuring that the maximum benefit is delivered to residents and businesses in the district.

A. Roof mounted Solar PV Canopies – GCC M1 – M18

Completed technical feasibility works have identified that the Duke St car park roof will house a 200kWp solar PV array of approximately 1,600m2, delivering 177MWh of renewable energy, which will be installed using a non-standard canopy mounting structure on the roof of the existing multi storey car park, to feed renewable energy into the electric vehicle charging infrastructure as well as into the proposed on-site battery storage (see task 3.3 above). The innovative canopy system will not only provide a source of renewable energy for integration with the EV charging and connected battery storage, but will also provide a way in which renewable energy can be generated from the roof of an open-top multi-storey car park without loss of parking spaces. This combination is an effective and innovative use of space which does not impact upon the revenue generation of the car park and will prove a replicable and scalable model, which will be integrated into WP6, for all similar multi-storey car-parks - of which there are many in dense urban environments - to integrate renewable generation assets onto their structure without detriment to their income generating capacity.

B. Innovative urban Vertical Axis Wind Turbines (VAWT) - GCC M6 - M24

In addition to the solar panels, we aim to deploy innovative urban Roof Mounted Ducted (RMD) or Vertical Axis Wind Turbines (VAWT) in suitable locations within the district. The renewable electricity generated by these VAWTs will be supplied – either directly or in a Complex Site arrangement - to the battery storage in the district. By effectively storing all of the local generation in the battery, to be used by various assets in the district, the maximum financial benefit, both for the recipients of the power and the generators of the power, can be achieved. Furthermore, ensuring 100% of the power generated by the VAWT is consumed in the district, we can ensure the carbon savings created by the VAWT impacts directly and positively on the City of Glasgow's carbon emissions reduction target.

The challenge associated with this task will be the technical challenge of connecting the turbines to the battery- either directly or via Complex Site arrangement - and the business case challenge of storing and selling the power. The application of a complex site arrangement, one in which the generation from the turbines is net against the consumption of a property near to the turbines and in the same ownership, thus avoiding expensive physical private-wire connections, will be a key aspect of this project. The application of a Complex Site arrangement will be applied where a direct physical connection is financially prohibitive and the required conditions of a Complex Site are met.

T4.3 Integration of E-Mobility (GCC) [M1 – M36]

Smart Solution G5: EV Charging hub in city centre car park

The car park in which the EV Charging Hub will be deployed is within 0.5 kilometres of a major motorway network, the M8 Motorway. The M8 is the busiest motorway in Scotland and one of the busiest in the United Kingdom, connecting Glasgow and Edinburgh.

Bringing both electric vehicle commuters and longer-distance electric vehicle users into the city to charge in a contained charging area will allow for improved planning of the electricity network in the city, via a clear understanding of the demands on the electricity network to ensure that the required network resilience is available. It will also promote economic growth in the area as more electric vehicle owners look for somewhere to spend their time while their vehicle charges, thus offering economic opportunities to existing and prospective business in the area.

Note: Integrating large numbers of electric vehicles into the grid will doubtlessly have an impact on the grid itself. The impact will be described and analyzed thoroughly.

Smart Solution G6: Intelligent LED street lights with integrated EV charging functionality, wireless communications network, and air pollution monitors

In addition to the development of an EV charging hub, it is proposed to incorporate electric vehicle charging points into planned installation of new LED street lighting columns funded through Transport Scotland ($\pounds 50k/68k$) the UK Green Investment Bank (c. $\pounds 6.2M / 8M$) and European Regional Development Fund / City Deal Funding (C. $\pounds 3M/4M$), as part of a wider city roll-out programme. The introduction of the integrated charging-lighting columns into a street scape will align with dedication of existing parking to electric vehicle only use.

The development of the above electric vehicle charging infrastructure, linked to the M8 motorway access, also complements plans to address a known traffic congestion area which occurs at peak times where commuters leaving the city cause heavy traffic and poor air quality. The progress towards more integrated EV infrastructure in the area, linked to development plans to address the congestion will offer the potential for the area to be restricted to public transport, electric vehicles, and cycling, thus improving the air quality of the area and reducing transport related CO2 emissions in the city by 311tCO2.

Task 4.4 Enabling low-carbon ICT solutions (Lead: GCC) [M1 – M36]

Tying together the various aspects of the project area will be a number of integrated ICT solutions, built to facilitate three main goals: enhanced management of the project area utilising established 'smart' ICT capabilities in the city, replication of the applied technical solutions across the city and out to other cities across the UK and EU, and further developing the city's move toward the implementation of a smart grid.

There are a number ICT solutions proposed that support the delivery of the outcomes from this project. These solutions aim to:

Enhance City management within the geographical project area based on deployment and use of 'smart' technology
Demonstrate the scalability and replication capability of the applied solutions across a wider 'footprint' in Glasgow, and other cities in the UK and EU

- Continue the development required to deliver on Glasgow's ambition to implement a Smart Grid and for Glasgow to become a leading Smart City

Task 4.4.1 Enhanced management of the project area utilising established 'smart' ICT capabilities in the city. (Lead: GCC) [M13 – M36]

In 2013, the city of Glasgow was awarded £24 million (32M€) by Innovate UK (then, the Technology Strategy Board) for the Future City Glasgow project, the aim of which was to demonstrate how a city could progress towards becoming a Smart City via a number of demonstrator initiatives.

The Future City Glasgow project resulted in, amongst other things: the development of an open data platform, a state of the art Glasgow Operations Centre; the rollout of Intelligent Street Lighting to a selection of sites across the city centre; a demonstration of demand-side management technology in the Council's buildings; and the development of an Energy App for the city.

Smart Solution G7: Smart open data Decision Platform/central management system

RUGGEDISED will build upon the existing open data platform and Energy App by creating a 'Data Based Decision Platform' (DBDP). The DBDP will take data feeds created by the project RUGGEDISED and include existing data feeds in the city to create a platform where users (the Local Authority, businesses, citizens, academics, etc) in the city can run queries based on analysis of the available data. An example of how this is specifically relates to the project is in the collection of data from electric vehicle users looking for available parking spaces in the city. Through the raising of a query, users will be able to see instances of other users having tried to locate a space and failed. The volume of fails per pre-determined time period could be used to assess the need to expand the existing charging infrastructure, or to develop a new charging hub at another point in the city. The development of Smart Solution G7 will be managed by Glasgow City Council through its 'City Data Team'.

If the above query was run in tandem with a query on existing heat-map data, using the national heat map created by the Scottish Government for the promotion of low energy and district heating solutions, and data sourced from the Energy App, it could be possible to locate a new electric vehicle hub in an area where renewable power would be particularly suitable, or where and industrial process could provide an economic advantage to development of an energy storage centre. The analytics developed will continue to evolve as more data sets become available and the level of queries becomes ever more sophisticated.

Upscaled Deployment and Replication of the applied solutions across the city and out to other cities across the UK and EU (Lead: GCC) [M36 – M60]

The collation of data, and integration of that data with the open data platform (the City Data Hub) would allow for academic institutions such as the 'Urban Big Data Centre' at the University of Glasgow or the 'Institute of Future Cities' at the University of Strathclyde to access and analyse the data, thus providing analysis of emerging trends in EV use, energy consumption, renewables deployment opportunities, energy storage locations, and so on. The outputs of such analysis would enable upscaled deployment and replication of the solutions implemented in RUGGEDISED across the city, Scotland, the UK, and the EU. Furthermore, the capture of 'open data' generated by RUGGEDISED will add value to the project through ensuring an efficient method of monitoring activity linked to the project deliverables.

The development of upscaled deployment will be managed by Glasgow City Council through its City Energy & 'Open Data' teams utilising the existing open data platform built by Glasgow City Council using Future City - Glasgow funding from Innovate UK, as well as the knowledge and expertise gained through delivery of the 'Open Data' and 'Energy Efficiency Demonstrator' aspects of the Future City - Glasgow project.

Smart Solution G8-10: Implementation of demand-side management technology in street lighting, in domestic and in non-domestic properties (Lead: SIE/SPPS) [M13 – M24]

One of the demonstration projects developed through the Future Cities Glasgow project was the application of demandside management (DSM) technologies in local authority buildings. This project installed demand-side management apparatus, linked to existing building management systems (BMS) across ten buildings owned by Glasgow City Council, representing a cross section of buildings uses (offices, depots, schools, etc).

The aim of the Future City - Glasgow demonstration was to show how, through the use of DSM apparatus, savings could be made at both network and building level, by enabling buildings to lower their demand from the electricity network, via the shut-down or reduction of certain pieces of equipment, to free load for the network to use to cover a high-demand event.

RUGGEDISED will be the next evolutionary step in DSM by integrating not only more non-domestic buildings – Council owned or otherwise – but electric vehicles, domestic properties and street lighting into an overall DSM controller, which will have links to the local electrical network. Through connection to smart control and smart appliances, such as washing machines or refrigerators that can communicate via a smart meter, DSM will deployed in a domestic scenario. The use of local storage will also look at the opportunities for domestic premises to participate in energy arbitrage. DSM equipment will be installed in 10 domestic properties and c. 5 additional non-domestic properties, as well as connect to c.4 EV charging points on street lighting columns and a network of c.2500 LED street lights (which will expand as the lights continue to be retrofitted with LEDs), all controlled though the Glasgow City Council's Central Management System with will have a DSM Controller connected via an API. The large storage device in the EV Charging Hub will also be connected into the central DSM controller, therefore providing DSM services as well as grid support. The development of Smart Solution G8-10 will be managed by Glasgow City Council in partnership with ESRU, SPPS, and Siemens.

Task 4.5 Smart city services to the community (Lead:) [M1-M60]

This task is intrinsically linked to all of the previously set out tasks in this work package. The tasks each provide a direct or indirect facilitation of access to smart city services in the community.

The DBDP, described above takes all of the data produced by the interventions listed in the WP and combines it with existing open data sets, providing a tool that will provide the analytical engine to allow citizens and businesses in the community to better access and analyse open data. Through this analytical assistance, citizens will be better placed to contribute to solutions both specific to their community and to the wider city.

The development of the DBDP as a user driven system, combined with the development of the innovation hub, will bring about added benefits to the city through the inclusion of a variety of user inputs and queries raising issues and creating solutions that were previously more difficult to realise by creating a technical software tool and physical space in which users with requirements and users with solutions can interact and work together to derive solutions.

The creation of an electric vehicle Charging Hub and charging infrastructure integrated into street lighting provides the community with access to EV charging. For citizens in high rise apartment blocks it is not possible to charge electric vehicles, giving these residents access to charging infrastructure during off-peak hours could present a route to increasing EV ownership in the city for residents of high rise and tenement blocks. In addition, the increase of electric vehicle charging infrastructure in the area, linked to renewable energy sources, could help small businesses in the area by bringing in a number of people looking for a short stay to provide a rapid charge of their EV.

Linked to the connection of low carbon decentralised energy via district heating, the Wheatley Group will use their energy advocacy service to ensure that citizens in the district are educated on how best to use their energy and to understand how their smart metering arrangements, linked to domestic demand-side management, will provide them with opportunities to change how they manage their energy demands and reduce their energy consumption and costs.

Regional up-scaling of solutions.

The project area encompasses a wide cross section of Scottish building types and demographics, including modern office buildings, historic buildings, students and academics, areas of deprivation, and centres of industry, thus providing significant opportunity for up scaling and replication across the city and in other cities in the UK. This results in a significant opportunity for regional up-scaling.

Through the development of DBDP in T3.6.1, an ICT tool will be created that takes open data and incorporates into a query based geo-spatial database, allowing strategic replication decisions to be made that are based on empirical data and thus are smarter and less speculative. The DBDP will be used to identify areas in which solutions deployed in the project district during the project life can be deployed in other parts of the city as well as informing of the best time to deploy solutions across the city, based on accurate data on the use and success of solutions linked to their specific building type, socio-demographic conditions, geographic conditions, and so on. The DBDP is explained fully in T3.6.1.

The feed of data from the project interventions into the DBDP permits the recording of detailed performance metrics which, when combined with project management information retained by Glasgow City Council in its role as WP coordinator, will be used to compile an inventory of progress providing detailed information for future delivery in other areas in the city, as well as providing a repository of information of high value to follower cities wishing to replicate the interventions in their city.

The development of business models to allow trading of energy at a local level between private, public, and domestic parties, through a 3rd party intermediary will result in the creation of standard contracts for heat and power at a local level and present an opportunity to apply those contracts to other parts of the city where district heating can provide and economically and environmentally beneficial solution.

The successful implementation of demand-side management technology in both domestic and non-domestic scenarios will produce an opportunity for mass roll out of the technology across the city, bringing the benefits of connecting citizens and assets to a smart grid. The potential for roll-out led by technology providers Siemens and the local electricity distribution network operator, Scottish Power Energy Networks, will also be high. From the data recorded through the deployment of the technology, performance of the technology, and associated business modelling, replication of the deployment of this solution should be achievable taking into consideration local geographic and technical conditions.

The development of a centralised EV charging Hub will provide Transport Scotland with a case study upon which to build their policy ambition of having electric vehicle hubs deployed across cities in Scotland as way to strengthen the development of EV charging infrastructure in a way that is fully integrated with smart grid capabilities where available.

Task 4.6 Activating the local innovation ecosystem (Lead: GCC) [M1-M36]

Glasgow City Council is developing an innovation hub (Venture Café) in a dedicated building, Tontine House, less than 500 metres from the project district. The hub has been designed to help foster and facilitate innovative solutions to issues facing citizens and businesses in the city. The RUGGEDISED project will seek to utilize this innovation hub to provide a place where citizens, businesses, officials, academics, etc. can gather to collaborate on creating smart city solutions based on data gathered from and created by the project. It will seek to use the Council's Sustainable Glasgow Partnership as the governance vehicle to provide a robust governance structure that can help take ideas and develop them into solutions.

The Tontine House Venture Café has been designed by Glasgow City Council to support the growth and impact of our businesses by providing flexible workspace, support and a positive environment to thrive. Through provision to flexible workspace, a supportive environment, and a stream of learning and networking opportunities, on three floors of the Tontine Hub, named 'The Curve', 'the Empire', and 'The Metropolis', Glasgow City Council aims to promote continued innovation in the city. The remaining floor of the building, named 'The Lightbulb' has been reserved for use by Glasgow City Council to work with citizens, academics, SME's, private sector, and others on establishing solutions to the issues faced by the city. The Lightbulb will provide an environment where open data, creative thought, experience, and insight can come together to explore issues and identify solutions away from the constraints of conventional working environments. The use of The Lightbulb space in tandem with access to open data, derived from both from the RUGGEDISED project and building upon existing databases captured and collated via the successful delivery of the Future Cities – Glasgow project, via the Data Based Decision Platform will position the city as a leader as an incubator for smart city solutions.

This task will look at how citizens of the project district can be engaged throughout the delivery of the solutions in the district to ensure that the interventions provide them with tangible benefits. The Wheatley Group, owners of the housing in the project area, will use their Energy Advocates to ensure communication links with citizens in the district.

The Institute for Future Cities' new City Observatory at University of Strathclyde uses data to understand cities in new ways, to help develop innovative approaches to solving urban problems (in areas such as sustainability, resilience and health), and deliver positive outcomes for cities. The City Observatory collects, manages and interprets data related to the urban environment. It uses data capture and analytic systems to enable Glasgow and other cities to understand their cities and systems, and how these interact more widely with regions, economies, communities, businesses and individuals. Data supplied from a wide variety of sources and systems – both live and historic helps create comprehensive models of the city – and understand how different system and factors relate to each other. Making data openly available removes barriers to innovation and helps the commercial, academic, and public sectors identify opportunities to achieve both business and governmental objectives.

Finally, Glasgow has been shortlisted as a finalist for the European Capital of Innovation award 2016 based upon its replicable innovation model based on partnerships across industry, science and communities. The model developed that led Glasgow to be shortlisted for this prestigious European award will, alongside the aforementioned innovation opportunities, form a key component of how this project ensures that it makes meaningful and tangible connection to the local innovation framework. To increase impact Glasgow will also develop a Smart City Implementation Package containing all information necessary to allow for replication in a wider community of EU-cities.

To maximise the potential for other cities to replicate the solutions being implemented, a detailed Implementation Report will be produced for each city (to be updated twice after its first delivery in M36). This will follow a project template established in WP1. The individual solution Implementation Reports will be combined within WP1 into a Lighthouse City Implementation Report.

Participation per Partner				
Partner number and short name	WP4 effort			
3 - GCC	78.00			
8 - ICLEI	2.00			
11 - US	12.00			
24 - TS	11.00			
25 - SPPS	16.00			
26 - TCB	6.50			
27 - SIE	34.00			
32 - WG	4.00			
Total	163.50			

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D4.1	Business Model allowing buildings selling heat (to each other and to local housing)	3 - GCC	Report	Confidential, only for members of the consortium (including the Commission Services)	12

List of deliverables Due Deliverable Date (in **Dissemination level**¹⁶ **Deliverable Title** Lead beneficiary Type¹⁵ Number¹⁴ months)¹⁷ Confidential, only Business Model allowing for members of the use of battery storage D4.2 27 - SIE consortium (including 36 Report as grid balancing the Commission mechanism Services) Business Case allowing D4.3 power transfer from CHP 3 - GCC Public 36 Report to battery Plan ready for innovative renewable installation 3 - GCC 36 D4.4 (netting off energy Report Public generation against consumption) Decision support Platform (ICT solution) D4.5 3 - GCC Other Public 36 for informing strategy and decision making Implementation Report D4.6 36 3 - GCC Report Public Glasgow (1/3) Deployment of EV D4.7 chargers in city centre car 3 - GCC Other Public 40 park Street lights (300) D4.8 replaced by intelligent Other Public 40 3 - GCC LED columns Implemented Management system D4.9 Other 42 to integrate domestic 27 - SIE Public properties into a 'smart grid' Implemented Management system to D4.10 integrate non-domestic 27 - SIE Other Public 42 properties into a 'smart grid' Analysis tools on LED street lighting D4.11 27 - SIE Other 48 implemented (to Public support demand-side management) Implementation Report D4.12 3 - GCC 48 Report Public Glasgow (2/3) Implementation Report D4.13 3 - GCC Report Public 60 Glasgow (3/3)

Description of deliverables

D4.1 : Business Model allowing buildings selling heat (to each other and to local housing) [12]

Task G1: A written document detailing the different replicable business models that can be applied for the sale and purchase of heat from a generator to a consumer (both from public and private sector, and recommending the optimal business model to present best value both economically and environmentally. This wil include detailed finacial modelling for each option. The optimal business model will the be subject to being approved by the GCC, UoS, & WG.

D4.2 : Business Model allowing use of battery storage as grid balancing mechanism [36]

Task G2: A written document detailing the different replicable business models that can be applied to a smart-grid connected battery that present best value to the battery owner and the grid operator, and recommending the optimal business model. This will include detailed finacial modelling for each option. The optimal business model will the be subject to being approved by the GCC, SPEN, & WG.

D4.3 : Business Case allowing power transfer from CHP to battery [36]

Task G3: A written document detailing the different replicable business models that can be applied to enable transfer of power generated by the CHP to the battery in the absence of a bespoke physical connection that presents best value to the CHP generator, the battery owner and the grid operator, and recommending the optimal business model. This will include detailed finacial modelling for each option. The optimal business model will the be subject to being approved by the GCC, SPEN, & WG.

D4.4 : Plan ready for innovative renewable installation (netting off energy generation against consumption) [36]

Task G4: Detailed technical and financial plan for the installation and management of innovative renewable energy generation technologies atop a multi-storey car park. The plan will also detail the integration with the battery, EV charging, and central management system.

D4.5 : Decision support Platform (ICT solution) for informing strategy and decision making [36]

Task G7: A link to, and screenshot of, the fully formed data based descision ICT platform that integrates open data generated by the the deliverables in WP4, as well as existing data and data generated by connected senors deployed through a series of complimentary smart city initiatives, funded externally to the project. In addition, a case study illustrating the use of the decision platform will be included.

D4.6 : Implementation Report Glasgow (1/3) [36]

To facilitate the replication of the RUGGEDISED solutions within the Follower Cities and beyond a detailed Implementation Report from each Lighthouse City on the solutions implemented. These will be aimed at providing relevant information to inform and facilitate the potential replication of the solutions identified in other cities. They will contain: 1. Background/context – Key targets, policies and other implementation drivers and framework conditions 2. The integrated smart city framework developed and applied within the project 3. Detailed descriptions of each solution applied, covering (precise aspects covered may vary according to the nature of the solution being described): - Technical implementation details - Process descriptions presenting the different stages of the planning, procurement, implementation and monitoring process - Business and contractual models applied - Integration with other solutions applied - Relevant citizen/end user engagement activities 4. Results - Detailed information on the overall impacts of the implemented measures, together with individual results per solution where relevant -Impact – on Energy efficiency, environmental performance, quality of life and social value - Economic assessment - Quantified information on the economic impact of the measures implemented, in terms of costs for the public authorities involved, business cases for the private partners and investors, and impact on job creation and wider economic development - Replication assessment - An initial assessment of the extent to which the technical solutions and the business/contractual models implemented in the Lighthouse Cities, may be replicated in other European cities The Reports will be produced by the Lighthouse Cities based on a template provided by ICLEI.

D4.7 : Deployment of EV chargers in city centre car park [40]

Task G5: Report detailing the quantity, capacity and location of EV chargers deployed as well as a screenshot of the central management system showing the integration of the charging infrastructre with the battery and renewable energy generation.

D4.8 : Street lights (300) replaced by intelligent LED columns [40]

Task G6: A screenshot of the central management system showing the project district and highlighting the installed intelligent LED lighting infrastructure with a detailed key explaining the extent of the intelligence and connections to comms and EV infrastructure. In addition, a report detailling the operational parameters of the LED lighting and associated connected assets.

D4.9 : Implemented Management system to integrate domestic properties into a 'smart grid' [42] Task G9: A screenshot of the central management system illustrating the connected domestic assets that are under control, and a report detailing the control parameters and integration points.

D4.10 : Implemented Management system to integrate non-domestic properties into a 'smart grid' [42] Task G10: A screenshot of the central management system illustrating the connected non-domestic assets that are under control, and a report detailing the control parameters and integration points.

D4.11 : Analysis tools on LED street lighting implemented (to support demand-side management) [48]

Task G8: A screenshot of the central management system illustrating the connected LED lighting assets that are under control, and a report detailing the control parameters and integration points.

D4.12 : Implementation Report Glasgow (2/3) [48]

To facilitate the replication of the RUGGEDISED solutions within the Follower Cities and beyond a detailed Implementation Report from each Lighthouse City on the solutions implemented. These will be aimed at providing relevant information to inform and facilitate the potential replication of the solutions identified in other cities. They will contain: 1. Background/context – Key targets, policies and other implementation drivers and framework conditions 2. The integrated smart city framework developed and applied within the project 3. Detailed descriptions of each solution applied, covering (precise aspects covered may vary according to the nature of the solution being described): - Technical implementation details - Process descriptions presenting the different stages of the planning, procurement, implementation and monitoring process - Business and contractual models applied - Integration with other solutions applied - Relevant citizen/end user engagement activities 4. Results - Detailed information on the overall impacts of the implemented measures, together with individual results per solution where relevant -Impact – on Energy efficiency, environmental performance, quality of life and social value - Economic assessment - Ouantified information on the economic impact of the measures implemented, in terms of costs for the public authorities involved, business cases for the private partners and investors, and impact on job creation and wider economic development - Replication assessment - An initial assessment of the extent to which the technical solutions and the business/contractual models implemented in the Lighthouse Cities, may be replicated in other European cities The Reports will be produced by the Lighthouse Cities based on a template provided by ICLEI.

D4.13 : Implementation Report Glasgow (3/3) [60]

To facilitate the replication of the RUGGEDISED solutions within the Follower Cities and beyond a detailed Implementation Report from each Lighthouse City on the solutions implemented. These will be aimed at providing relevant information to inform and facilitate the potential replication of the solutions identified in other cities. They will contain: 1. Background/context – Key targets, policies and other implementation drivers and framework conditions 2. The integrated smart city framework developed and applied within the project 3. Detailed descriptions of each solution applied, covering (precise aspects covered may vary according to the nature of the solution being described): - Technical implementation details - Process descriptions presenting the different stages of the planning, procurement, implementation and monitoring process - Business and contractual models applied - Integration with other solutions applied - Relevant citizen/end user engagement activities 4. Results – Detailed information on the overall impacts of the implemented measures, together with individual results per solution where relevant -Impact - on Energy efficiency, environmental performance, quality of life and social value - Economic assessment - Quantified information on the economic impact of the measures implemented, in terms of costs for the public authorities involved, business cases for the private partners and investors, and impact on job creation and wider economic development - Replication assessment - An initial assessment of the extent to which the technical solutions and the business/contractual models implemented in the Lighthouse Cities, may be replicated in other European cities The Reports will be produced by the Lighthouse Cities based on a template provided by ICLEI.

Schedule of relevant Milestones

Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
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Work package number ⁹	WP5	Lead beneficiary ¹⁰	6 - AIT
Work package title	Monitoring and Evaluation		
Start month	1	End month	60

Objectives

As the evolution of a city's infrastructure is a slow but steady process monitoring of changes towards a smart district has to be done over a long term. Therefore a two year post-implementation phase deals with the day-to-day running of the monitoring infrastructure and the collection of off-line data and qualitative feedback from citizens and other end users needed to get insights and validate the approaches. The goal is to provide project partners and stakeholders with tangible results on the transformation of the district into a low energy district with integrated infrastructure and sustainable mobility.

At the start of this WP in T5.1 (Specification of the monitoring methodology), the demo sites are evaluated to get to an as-built view on the implemented procedures and technologies. Based on this the evaluations needed at the end of the project are defined, leading to requirements for monitoring and data collection. The monitoring procedure is then set up (Task 5.2: Set up of the monitoring infrastructure) and taken care off (Task 5.3 Data collection). This provides high quality data, which in T5.4 (Continuous Analysis) is evaluated on a regular basis, to judge the success of the project and provide input to other work packages as well as local participants and stakeholders. Furthermore, the generated material is used for dissemination.

At the end of the project, both the processes during the implementation and post implementation as well as their relationship to each other are analysed (T5.5 Process evaluation). Finally, the overall impact of the project is assessed in Task 5.6: (Impact Assessment) and Task 5.7 (Evaluation of measures taken to maximize the impact).

The main objective of WP5 therefore is to provide WP 1 & 6-8 with already analysed project results, allowing those four WPs objective decisions based on reliable data, transparent evaluations and valuable expert knowledge.

Description of work and role of partners

WP5 - Monitoring and Evaluation [Months: 1-60]

AIT, ROT, UME, GCC, SP, ISINNOVA, TNO, UU, US, Brno, Parma, Gdansk, BN, RET, ENE, KPN, AHAB, VCC, UEAB, UPAB, TS, SPPS, TCB, SIE, INF, SI

Task 5.1: Specification of the monitoring methodology (Lead: AIT; Partners: ROT, UME, GCC, TNO, SP, US, UU) [M1-M12]

To be able to provide comparable results across three lighthouse projects which are meaningful for the consortium partners as well as the follower cities, the different metrics used in difference countries have to be harmonized. Although there are some projects towards this harmonisation of calculations and standards, additional challenges will rise from the cross cutting nature of project, as mobility, energy, ICT and user participation will all have to be covered. Privacy and security concerns will be investigated to ensure not only compliance with the local laws and standards, but also improve the user acceptance of the solutions. The regulations regarding follower cities are also taking into account, laying a foundation for the feasibility of the solutions. This leads to the definition and target numbers for the KPIs based on the detailed project goals and the final state of the lighthouse projects. From these targets action specific monitoring and evaluation methodologies can be derived, containing detailed plans and formulas for the cases actually implemented, while also considering possible replications scenarios.

Task 5.2: Set up of the monitoring infrastructure (Lead: AIT; Partners: ROT, UME, GCC, SP, TNO, US, UU) [M13-M24]

At the end of the implementation phase, the three demo sites have to be prepared for the monitoring and evaluation phase by the WPs 2, 3 and 4, so the infrastructure is able to operate outside the experimental conditions in the demo phase, which is guaranteed by requiring at least TRL 7 for the solutions implemented there. Therefore a data storage integrating the data measured at the demo sites or collected from citizens is set up, allowing for easy sharing and cooperation between the consortium members responsible for the evaluation. Data flows from the three demo sites into this data storage are designed keeping in mind the privacy and security requirements found in T5.1 as well as reasonable data quality, and then implemented and tested. From the documentation of these data flows, a plan for fault and failure mitigation is derived. For each and every data source and channel a technical responsible entity is defined, along with

an entity responsible for the demo site. This prepares the ground for task 5.3, allowing for a focused response in case of faults or failures, with the responsible partner coordinating the work of at the site, e.g. with local maintenance personal, and partner in charge of the data storage.

Task 5.3 Data collection (Lead: AIT; Partners: ROT, UME, GCC, SP, TNO, US, UU, BN, RET, ENE, KPN, AHAB, VCC, UEAB, UPAB, TS, SPPS, TCB, SIE, INF, FI, SI) [M7-M60]

As the three lighthouse projects are long term demonstration projects, some upkeep has to be foreseen. This ensures that faults and failures in the monitoring equipment are detected using the results of T5.2. If needed, troubleshooting procedures will be initiated by the task lead. Responsible entities at the demo sites will coordinate the local partners to promptly find and repair the sources of the data faults or failures to ensure a continuous data flow. Furthermore the outgoing data streams into e.g. systems for Open Data provision will be maintained to allow planning security for the third parties already working with or offering services based on these data sources. All actions and other changes within the sites will be documented throughout to be able to trace apparent inconsistencies in evaluations back to their sources easily. Furthermore the survey based data collection activities that collect feedback from the citizens and other end users regarding their subjective perception of the different services are organized within this task.

Task 5.4: Continuous Analysis (Lead: AIT; Partners: TNO, SP, US, UU) [M18-M60]

To utilize the continuous monitoring of the three sites, the data gathered in WP5.3 will be analysed and evaluated on a regular basis according to the calculations and targets defined in T5.1. Furthermore low level analysis of the implemented infrastructure will be conducted in order to answer more specific questions from the technology providers or owners of aforementioned infrastructure. This will happen under the consideration of changes documented by T5.3. A high degree of automation based the data storage is envisioned, allowing the relevant partners to obtain results also after the project, if the monitoring is kept in place. Data will be entered into the Smart City Information System on a regular basis.

Task 5.5: Process evaluation (Lead: SP; Partners: ROT, UME, GCC, AIT, TNO, US, UU) [M7-M60]

This task is divided into two main activities. On one hand it is oriented towards the generation of main methods in order to allow process evaluation activities, on the other hand the post evaluation of the processes to be performed at the end of the project are analysed in depth. Overall, Task 5.5 will provide insights in how the processes for implementing different parts of the Smart City and their connections either support or hinder the transition into a smart district.

The process evaluation will focus on the non-technical activities and outcomes of the project. Three specific areas will be monitored closely; processes on development of business models and their impact on risk reduction, management and organisational aspects, social impacts of smart city demonstrations, and transfer of knowledge and replication to the follower cities. The actions in various WP:s will be categorised in order to map how they contribute to these three categories.

At the very beginning of the project the first part of the task aims to define a set of tools and methods to successfully evaluate processes of the project in order to be able to establish an ongoing evaluation process over the whole project lifetime. The task is specifically going to support qualitative evaluation processes to be performed in other parts of the project. It is foreseen to develop mainly qualitative evaluation tools, enabling the project partners to evaluate the consistency of ongoing processes with existing framework conditions, reference projects and recommendations. This will be especially useful in supporting the evaluation of non-quantitative aspects of the implementation processes in the context of social, regulative, and administrative issues during the final phase of the project.

Apart from the KPIs resulting from the solutions realized within WP2-4, the process leading to these solutions has to be monitored and evaluated. The realization will be compared to the original plans, and the reasons for changes (both improvements and downgrades) made will be analysed. In parallel the overall implementation processes themselves will be investigated. The technical, administrative and regulative aspects of the processes are interdependent, and may either facilitate or hinder the overall transition into a smart city. This of course also revolves around the end user acceptance, which depends crucially on the processes introducing the new concepts and technologies as well as their long term usage.

Task 5.6: Impact Assessment (Lead: TNO; Partners: ROT, UME, GCC, AIT, SP, US, UU) [M55-M60]

At the end of the post-implementation phase, the overall impact of the technologies and processes implemented within the project will be evaluated, according to the objectives and indicators defined within WP1 and T5.1. Certain aspects of the impact can be quantified using the results of T5.4, especially the environmental impact. Social impact and economic impact need to be assessed by using the monitoring and analysis data, along with further surveys and data from the cities.

The alignment of the lighthouse projects with the smart city strategies of the respective cities also has to be considered, and whether the project had an impact on the individual city's plans.

Task 5.7: Evaluation of measures taken to maximize the project impact. (Lead: ISINNOVA; Partners: AIT, BRNO, PARMA, GDANSK) [M36-M50]

This task will monitor and evaluate the effectiveness of the measures put forward in WPs 1,6 & 9 to maximize the impact of the project. This will be mainly related to the knowledge advancement and the replication of smart solutions in the follower cities, but also, more generally, to the uptake of the smart solutions implemented in this project in the rest of the EU. Within this important task it will be assessed the effectiveness and the ability to meet the impact targets expected by the different activities, e.g. knowledge advancement, replication, dissemination and contribution to SCC1 as a whole.

Participation per Partner

Partner number and short name	WP5 effort
1 - ROT	3.00
2 - UME	3.00
3 - GCC	3.00
4 - SP	10.00
5 - ISINNOVA	2.00
6 - AIT	61.50
7 - TNO	16.00
10 - UU	6.00
11 - US	8.00
13 - Brno	2.00
14 - Parma	2.00
15 - Gdansk	2.00
16 - BN	0.50
17 - RET	0.50
18 - ENE	0.50
19 - KPN	0.50
20 - AHAB	0.50
21 - VCC	0.50
22 - UEAB	0.50
23 - UPAB	0.50
24 - TS	0.50
25 - SPPS	0.50
26 - TCB	0.50
27 - SIE	0.50
30 - INF	0.50
34 - SI	0.50
Total	125.50

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D5.1	Monitoring and evaluation manual	6 - AIT	Report	Public	12
D5.2	Evaluation templates	6 - AIT	Report	Public	12
D5.3	Maintenance plan	6 - AIT	Other	Confidential, only for members of the consortium (including the Commission Services)	18
D5.4	Monitoring Documentation	6 - AIT	Report	Confidential, only for members of the consortium (including the Commission Services)	60
D5.5	Assessment of light house projects (interim report ready at M48)	6 - AIT	Report	Public	60
D5.6	Analysis of alignment with City strategies	7 - TNO	Report	Public	60
D5.7	Monitoring report on measures to maximize the impact	5 - ISINNOVA	Report	Public	60

List of deliverables

D5.1 : Monitoring and evaluation manual [12]

A manual to assure that the data gathered in the lighthouse cities is comparable. Common standards for monitoring and evaluation are described. On one hand, already existing standards (e.g., Smart City Information System) are catalogued for the use of the cities. On the other hand, calculation methods for results not already covered are described. This is done for the quality of data as well, which will influence the actual monitoring implementation.

D5.2 : Evaluation templates [12]

Templates to enable distributing the evaluation of the demo sites, formalizing the content of D5.2. Using those templates, responsible persons for certain topics (e.g., renewable heating and cooling) ca be assigned for each demo site to do the evaluation on a local level. This assures that the evaluation process is the same in every city.

D5.3 : Maintenance plan [18]

A technical document describing all data sources, data sinks and the communication channels in between and the responsible persons. It enables the project to react to problems in the large distributed monitoring infrastructure quickly and efficiently to assure clean and complete data.

D5.4 : Monitoring Documentation [60]

Alongside the maintenance plan, this document will describe the actual monitoring process and the data gathered. Apart from reporting amount and quality of data gathered, it will feature all occurrences during the monitoring that may influence the results.

D5.5 : Assessment of light house projects (interim report ready at M48) [60]

Report on the overall results of the demonstration sites. It will contain a quantitative and qualitative assessment of the implemented projects in the three lighthouse cities. Furthermore it will describe the tools created for the process evaluation, as well as the impact the project had on the processes within the lighthouse cities. It will have an interim stage at M48.

D5.6 : Analysis of alignment with City strategies [60]

A summary how well the achievements of the demonstration projects are aligned with the cities strategy. If alignment is weak or non-existing, this will be reflected upon, leading to either recommendations for changes in or expansion of the city strategies, or lessons learned for the replication.

D5.7 : Monitoring report on measures to maximize the impact [60]

The report provides an assessment of the effectiveness of the measures put forward to maximize the impact of the project, thus looking beyond the actual impacts borne the smart solutions in the light house cities. The focus is primarily on the effects of the sustaining actions delivered by WP1, WP6, WP7, WP8 and WP9, which relate to knowledge advancement, replication of smart solutions in the follower cities, and the more general uptake of the smart solutions implemented by the project in the rest of the EU.

Schedule of relevant Milestones

Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
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Work package number ⁹	WP6	Lead beneficiary ¹⁰	4 - SP
Work package title	Enabling upscaled deployment and business model innovation		model innovation
Start month	9	End month	60

Objectives

WP 6 has the main objective to ensuring a city wide upscaled deployment of the smart solutions in Rotterdam, Umeå and Glasgow. Implementing Smart City measures in a district, such as demonstrated in WP 2-4 will be a great effort, however this will likely not affect the energy balance or modal share of the transport system for the whole city or city-region. WP 6 will support the Lighthouse cities and pave the way for such a large scale, city-wide implementation.

Specific objectives are:

- To establish Innovation platforms that will build capacity and a forum for working with urban innovation and upscaling Smart solutions

- To function as a business model incubator and to set up a structured approach and methodology for reviewing the results of the demonstration projects, as well as the before mentioned analyses,

- To develop business models for a wider up-scaled deployment

- To develop possible future scenarios in order to assess influence on the potential of the smart solutions

- To simulate the effects on the urban energy systems from individual or combined upscaled smart solutions, thereby understanding the robustness and possible investment needs of the energy system in the Lighthouse cities.

- To look into the Socio-economic conditions around the smart solutions and pinpointing the Critical conditions (legal, tax related, political/administrative, financial) for upscaled deployment.

Description of work and role of partners

WP6 - Enabling upscaled deployment and business model innovation [Months: 9-60]

SP, ROT, UME, GCC, ISINNOVA, AIT, TNO, EUR, US, ENE, UEAB, SPPS, SI

WP 6 builds to a large extent on the output of WP 1. Findings and conclusions in WP 1 that are generated in order to maximise the results of the smart solutions will be an excellent starting point and input to further analyses and operative work on up-scaled deployment in WP 6. Scaling up smart solutions does primarily not involve assessment of technical capacity. Instead focus will be on understanding the performance of technical smart solutions in a wider context by looking at socio-economic factors. The verification of the different smart solutions in RUGGEDISED will be done in WP 2-5. Assessing the potential of upscaling the solutions require a close look at boundary conditions, which are primarily found in interlinked systems of the city. Systemic analysis is a way of showing how actors, components or nodes are interlinked and affect each other, and this approach will be the basis for assessing the potential of the smart solutions carried out in the Lighthouse cities. This approach is also the basis for the operative tasks dealing with setting up an institutionalised framework for urban innovation.

WP 1 delivers an overview of business models used and deployed in the LHC's, energy performance data from the district energy planning tool, and experiences from socio-economic aspects, that are influencing implementation the ability to upscale smart solutions. In particular the work of the liaison groups will feed into the local establishment of Innovation platforms, the elaboration of business models and the analytical tasks in WP6 will pick up conclusions. An iterative process is also possible where local elaboration of structures and processes in the Lighthouses in WP 6 will provide input to the common discussions and exchange in WP1.

Other inputs from other WPs are:

- a detailed description of the technologies and their energy performance (WP 2-4).
- an initial guideline on KPI's relevant for up-scaled deployment (WP 5).
- an initial overview of topics of interest from follower cities related to WP 6 activities (WP 7)

- guidelines for dissemination (WP 9)

A successful up-scaled deployment depends on continued technological developments and appropriate governance, conditions which themselves depend on the evolving context of politics, economics, societal arrangements, technological change, environmental conditions, and values of citizens and stakeholders (PESTEV).

Task 6.1 Urban innovation platforms. (Lead: SP; Partners: ROT, UME, GCC, TNO, US, AIT, SIE) [M9-M60] The success of Smart Cities lies as much in the possibility to transform urban development towards an inclusive process, as in the deployment of technical components and systems. The demonstration measures implemented in WPs 2-4 will only be possible to carry out in a partnership between several stakeholders and actors in the Lighthouse cities. In order to scale up the business models established to govern the technical demonstration projects, a close collaboration structure between relevant actors in the Umeå, Glasgow and Rotterdam needs to be established.

Task 6.1 therefore contains the establishment of Urban Innovation Platforms, within which all the other tasks of the WP will be carried out. Urban Innovation Platforms have been tested with good results and are recognised as a key structure for allowing cities to stimulate creative processes for urban development, identification of key actors and stakeholders and mutual sharing of risks in connection to development projects. The work of the platform should be aligned to overarching political visions of the cities; however, these platforms are not a tool for the municipal bodies to implement public policy. Instead the platforms should allow for an open process where innovative solutions are identified, developed implemented and assessed by public, private and research actors in a structured fashion.

This task has two main phases. The first phase (M9-18) focuses on the establishment and start-up of the platforms. Three surveys will be carried out within the local consortiums for Umeå, Glasgow and Rotterdam respectively, to identify and map existing structures and key actors. A European outlook on collaborative arenas similar to the concept of Innovation Platforms (Knowledge of practice, living labs etc.) will be carried out under the leadership of AIT. These studies will provide the knowledge on good practice cases of actor-network constellations, stakeholder involvement and generic features of innovation platforms in Europe. Lessons learned will feed into the individualised design of each of the three innovation platforms in the next step.

An analysis will be made of the local innovation ecosystem. This will be done based on Transition theories which focus on different actors needed for a local context that supports innovation. With this analysis, organisations and persons will be identified in each Lighthouse City that should be involved in the Innovation platforms to explore related new business opportunities. The actors of the local innovation ecosystem include : government (institutions that provide funding mechanisms and programs, regulations, policies and incentives), universities, industry (companies and industrial associations), supporting institutions (private or public organisations and independent professionals who provide knowledge), local entrepreneurs (start-ups, individuals who own an idea, discovery or invention), financial system (banks, angel investors, virtual capitalists, industries), customers (people, companies, etc.), and civil society (individuals, NGOs associations who create societal and environmental demands. For each Lighthouse City a list of actors that can be invited to the District Innovation Labs will be made. The Lighthouse cities will select the definitive lists of actors to invite. This task will be performed by the Lighthouse cities together with their knowledge support organisations (SP, US, and TNO).

The next step is to gain the support and commitment from key participants. Even though platforms are to be open and inclusive, the efficiency of their work lies in an effective organisation with key stakeholders. The actual composition of the partnership or "consortium" may differ due to local circumstances. Here it is also important to assess existing forms of collaboration and innovation infrastructures which the platform could be aligned to. The involved partners will be reviewed in order to gain more knowledge about their internal interests, capacities and possible contributions to generating innovative business models. The liaison groups of WP 1 will provide an initial basic knowledge of this, but other complementary studies on a city level will be needed.

The first phase will be summarised in the report D6.1 Initial findings from the establishment of Innovation Platforms (M18). The report will be compiled by SP with contributions from the lighthouse cities and their supporting research organisations.

The second phase (M18-M58) will focus on how the innovation platforms can be integrated into the urban innovation eco system and how it will be managed in the long run. Here a long term management regime will be elaborated including governance structure, key partners and processes and resource allocation. In this respect an agreement of a legal framework for the involved actors needs to be established. The framework will be influenced by the outcomes of the business model generation work in task 6.2. A structured approach for Innovation Management will be used. The forthcoming ISO standard on innovation management could be such an approach. Communication strategies for increased visibility and acceptance will be established by each platform. Apart from serving as a centre for actors to collaborate on the generation of business models, the Innovation platforms also have a crucial function to seek synergies with funding sources such as ESIF or national funding that can be used for Innovative smart solutions. The plans for a long term integration of Innovation Platforms will be summarised in D6.2 Plans for integration of Innovation Platforms (M30).

The Innovation platforms are foreseen to be further developed in terms of partnership, focus areas and supporting research throughout the duration of the project. Finally the entire work will be summarised in the report D6.3-Innovation platforms for Innovative cities (M58). The report will be compiled by SP with contributions from the WP partners.

The work of establishment the Innovation Platforms are a key feature of RUGGEDISED and will not only be relevant for the Lighthouse cities. The follower cities will be able to follow the processes and take part of the conclusions and will also be shared with other Smart Cities projects through WP 8, as well as disseminated through WP 9.

Main Outcomes: Institutionalised capacity for upscaled deployment of Smart Solutions through the establishment of Innovation Platforms.

Task 6.2 Developing methods for innovative business models for upscaled deployment (Lead: SI; Partners: ROT, UME, GCC, SP, AIT, TNO, ISINNOVA, EUR) [M18-M48]

Task 6.2 will build on the detailed knowledge of existing business and financial models in the demonstration projects of WP 2-4 which is also collected in WP 1.

As a part of Smart City Business Model development task 6.2 will identify possible benefits, risks and challenges that are related to upscaling (extending the scope of use cases from that of the piloting phase).

In the future Smart City an enormous amount of data is collected and made available for different actors for further refinement. Data can be used for visualisation purposes for the citizens, for better understanding and control of different flows and events for the city government, as a base for new and innovative business creation for the industry, and for researchers to reveal new patterns and hidden relationships.

Task 6.2 will shed light on profitable business models and opportunities at different scales as well as synergies that result from operating multiple different technical solutions within a single city and ecosystem setting both specific and generic limitations to the upscaling. This process needs to be iterative and feed back to task 6.1 where actors involved in Smart City innovations are gathered. Conclusions from the liaison groups in T1.3 on the validity of the used business models will be taken into account in order to adapt the methodology for business model generation.

The collection of financing models for the smart solutions in WP1 will be analysed and synthesised to create an overall Smart City Business Model Approach, which is applicable to different environmental and organisational characteristics and that can be used in novel business generation for Lighthouse Cities as well as follower cities. Ecosystem and open innovation thinking will be incorporated to adequately explore value creation and capture of business model innovation within each Lighthouse city to analyse the whole value network and the overall value architecture. The task aims at facilitating generic governance models and business concepts by recognising the common features of parallel applications in the Lighthouse cities. This will allow the project to gain and share knowledge on common rules or crucial aspects for cities to create innovative and bankable smart solutions.

The business model archetypes and generic governance models will be combined together with input and lessons learnt from the other WPs to create holistic business ecosystem profiles, of each Lighthouse city. Here the more generic stories ("story telling" method) of the Lighthouse cities will be combined with the stories of pilot cases. These stories and ecosystem profiles will give a vibrant picture to readers who can then dig deeper into each case. The report will be published both as narratives and slide shows for dissemination purposes. The results will be summarised in D6.4 Business models for Smart Cities –conclusions on methods for generating bankable smart solutions, which will build on input from all WP9 tasks and will be made publically available.

Main outcome of 6.2: A Smart City business model approach, which contains a methodology for generating bankable smart solutions in cities.

WP 6 thus establishes both the organisational capacity and structured methods for generating bankable smart city services and solutions. To further support the understanding of the potential of the innovative business models for Smart Cities, three dedicated analyses will be carried out to explore the surrounding contexts and their influence on the long term outcomes and potential of smart solutions in WP 2-4.

Task 6.3 Contextual Scenario analysis (Lead: SP. Participants: ROT, UME, GCC, AIT, TNO, US, ISINNOVA. M10-M18)

The process of up scaled deployment of the demonstration technologies will play out over a much longer time frame than the lifespan of the project, and many of the contextual factors (such as economic development, public funding potentials, demographic change, emerging technologies and breakthroughs, climate change effects, lifestyle changes etc.) are characterized by uncertainty, interdependencies, and feedback loops. A contextual scenario analysis will generate rich descriptions of plausible, relevant alternative futures in order to help the lighthouse cities determine which options for action are most robust. The scenario analysis will be a participatory process, so that the lighthouse stakeholders – i.e. lighthouse coordinators, technical and non-technical experts of the cities, as well as local stakeholders (and guest experts) can benefit not just from the analysis per se, but from interactions with each other regarding their expectations for the future.

First, the work will be initiated via a workshop in Month 12 with all three lighthouse cities, which will identify the contextual factors most relevant to the up scaled deployment process using the STEEP-approach (analysis focusing on Social, Technological, Economical, Environmental, and Political aspects; also sometimes referred to as PESTEL-analysis) to identify trends and drivers of change. In order to adapt the scenario methodology to the technology upscaling

process, this workshop will use the Context and Critical Conditions (CCC) framework, used for a transfer of best practice or for technology transfer, to guide the factor identification. Key results will be formulated in a briefing paper provided to the participants in the first workshop. They will also provide valuable material for the foresight process with follower cities in WP7 T7.3.

This first workshop will be the forum for the analysis of the landscape-factors, trends and drivers, i.e. the outermost contextual systems for innovations at the level of urban regions. This workshop will be planned by foresight and innovations system experts at SP and AIT, and will be undertaken back-to-back to the project meeting in M12. Participants will be the city representatives supported by the research actors TNO and Strathclyde for Rotterdam and Glasgow respectively. The output of this workshop will be qualitative data on major factors of influence to the smart solutions.

A follow-up analysis will prioritise and thematically group the identified factors, based on a review of most recent scenario literature for sustainable and smart cities, as well as interviews with lighthouse city stakeholders. This work will be coordinated by SP (which will also perform the Umeå interviews) and AIT (will provide scenario study material through the European Foresight Platform and other sources) with support from TNO (will conduct Rotterdam interviews) and Strathclyde University (will conduct Glasgow interviews), and will result in a framework for the scenario narratives. A second, smaller workshop will be held in M18 to present the framework and generate the basic storylines for the alternative scenario narratives. This workshop will be an intensive effort with the WP partners AIT, SP, TNO, ROT, GCC, UME, US and one or two experts from each lighthouse city only. Outputs from this workshop are first draft of narrative scenarios.

Based on the output of the two workshops, a set of 'rich narratives' describing alternative futures for the contextual systems common to the lighthouse cities, in a 15-year perspective, will be produced by SP. These narratives will describe plausible futures wherein the most important factors (drivers, barriers, framework conditions) play out in different but internally consistent ways. These narratives will be (broadly) relevant to all lighthouse cities. They will also be shared with the follower cities in WP7 T7.3.

The implications of the different scenarios for upscaling will be primarily explored in Tasks 6.1-6.2. In order to facilitate these analyses, a first inventory of implications for energy system modelling (for 6.4) and implications for governance and business models (for 6.1-6.2) will be collected, from WP1 (between M8-12) and through stakeholder interviews on a per-city basis and led by SP (for Umeå), Strathclyde (for Glasgow) and TNO (for Rotterdam).

The follower cities will be invited to contribute to the scenario development, which is in any case generalized for the 3 lighthouse cities and focused on (mostly) common contextual issues. The analysis of scenario implications will only be undertaken for the lighthouse cities, and the results will be made available to the follower cities. A seminar wherein the lighthouse cities present their results and follower cities are given the chance to react and critique will take place back-to-back to a General Assembly meeting. Results of the scenario analyses will be presented at project meetings and will be published through relevant dissemination channels.

Task 6.4: Assessing the long-term scaling potential and energy system effects of the light house smart solutions. (Lead: SP; Partners: ROT, GCC, UME, TNO, US) [M18-M30]

This task will perform analyses of the effects from scaling the demonstrated solutions in the participating cities as well as on a wider scale. The aim is to assess energy system effects when the proposed technologies are scaled up in order to analyse benefits and potential negative effects and investment needs in other parts of the system as results of the upscaling. The system here refers to both the energy system within the cities, and to the surrounding energy system.

The results from this task will provide input to task 6.1, 6.2 and WP7 which will analyse the scaling and replication potential of the demonstrated smart solutions. The results will also contribute to the analyses and development of business models in task 6.2, since system benefits points in the direction for potential business cases. Thereby this task contributes with analyses concerning the market conditions for business development.

The analyses will be based upon the contextual analysis and scenarios from task 6.3 and data from the demonstrations in WP2, 3 and 4. WP1 will also produce valuable output on effects on a district level from the smart solutions. The two tools are complementing each other. The district tool in WP 1 will generate detailed knowledge and conclusions on a district level, whereas the tool in WP 6 looks at a city level and its surrounding systems. Simulation results from the demonstrations will provide input concerning the cities' energy systems, and the scenarios will provide input concerning projected further development and deployment of the demonstrated technologies within in the cities as well as development of the surrounding energy system and market. The task follows the following process:

Data and results for the demonstrated technologies in the cities are collected from WP2, 3 and 4 as well as the district simulation tool developed and tested in WP 1. The local Lighthouse city partner will share data that is generated and which feed into the local monitoring platforms or other relevant data needed to make this analysis. A model is then constructed and validated by using the collected data. The model includes a detailed representation of the analysed
cities, and an approximate representation of the surrounding energy system. SP will lead on the definition of needed data. TNO and Strathclyde will support the Lighthouse city in reviewing the existing data.

Upscaling scenarios are created based on the scenarios provided by task 6.3. The upscaling scenarios are analysed using the validated model. Results concerning system effects and market conditions for business development are gathered and reported to task 6.2 and could contribute to task 6.5.

The analysis described above will identify and quantify system effects of scaling up the smart solutions of the lighthouse cities. The effects can be expressed in terms of e.g. economic benefits, savings of primary energy use, or emission reduction. All of these will be assessed in the task. The energy systems in the cities will be analysed on a detailed level while the impact on the surrounding energy system and market will be performed on a less detailed level. An example of this is that effects on the electric distribution network in the cities will be assessed, while on a wider scale, approximate effects on transmission level will be considered.

It can be noted that the effects of upscaling on the system is generally not linear. Marginal benefits of the introduction of smart solutions might be decreasing with the level of upscaling, or threshold effects might occur due to limitations in infrastructure as the solution is scaled up. It should also be noted that the upscaling of one solution can lead to investment needs in other parts of the system, owned by other actors, e.g. EV charging infrastructure leading to grid reinforcements. This task will include identification of such effects, and on what upscaling level they occur for the different cities. SP will lead on generating the analyses; one for each lighthouse cities. This will be summarised in D6.2 which will be presented at a project consortium meeting together with a seminar on methodological approach and relevance for the follower cities. The conclusions of the report will also be disseminated to a wider audience through relevant channels. The outcome of 6.4 is a set of energy scenarios indicating the critical influences and aspects to the energy system from upscaling smart solution such as the demonstration projects. This knowledge is a valuable support for decision makers and planners in cities when determining strategies for energy investments. The outcomes are relevant for LHC's, follower cites, WP 8 for further cooperation with other projects.

Task 6.5 Urban innovation system analysis (Lead: SP; Partners: UME, GCC, ROT, TNO, ISINNOVA, US) [M18-M26] Building on the handover from task 6.3 (the scenario analysis), task 6.5 will consider the governance needs for upscaling in using a Technological Innovation System perspective. The focus for the Context and Critical Condition Analysis will move to the System (here the Urban Innovation System) and the subsystems such as urban areas for extension, technological clusters, value chains, etc. Three workshops will be held (one in each Lighthouse city) where the following topics will be discussed: Entrepreneurial activities; Institutions (Legislation), Entrepreneurial activities, Market, Guidance for search (where search = search for solution to the needs), Resource mobilization, Knowledge development and dissemination, Creation of legitimacy and Policy. A map of needs and alternative measures coupled to each innovation system function will be drawn for the smart solutions in each lighthouse city, where some solutions will be prioritized. Input from the WP 1-4 is essential and will be collected by the light house city participants with support from SP, TNO and US. TNO also plays an important role by providing the link to the relevant output of WP 1 that is relevant for T6.3. In the beginning of this task SP will develop a questionnaire and provide the light house cities as well as the supporting partners with the questionnaire and the relevant information needed. Further in-depth interviews with key stakeholders and experts in the region will take place. In this task focus will be on the boundaries for each solutions, and will give valuable input to task 6.2 (the business model) regarding the surrounding landscape for the solutions. There will be similarities but also differences between each lighthouse city as well as for the follower cities. The analysis will mainly be for each lighthouse city, but gives valuable information for the follower cities. Input from the WP2-4 as well as participation from the light house cities is essential, but also output from this task will be provided for WP2-4. A close collaboration and exchange of results and discussion will take place between task 6.1 and 6.2. SP coordinates the analysis with input from the TNO, AIT and US.

Task 6.3 concludes its work in D6.7 "Report on CCC process and results from each Lighthouse city". The report identifies the main critical conditions from a socio-economic perspective on the demonstrated Smart solutions.

The outcome of this task will be a socio economic analysis, relevant for LHCs, FCs, and WP 8.

Outputs:

- Innovation platforms in the LHCs. Relevant also for FCs, WP 8.

- Exploitation and facilitation of development of new business models for ICT services. Relevant for LHCs, FCs and WP 8

- Scenario analyses for each LHC. Relevant for LHCs and FCs.

- Energy systems analysis. Relevant for LHCs, FCs and WP 8 for further cooperation with other projects.

- Socio economic analysis. Relevant for LHCs, FCs, WP 8

- All outputs relevant for WP 9 for dissemination and communication purposes

Participation per Partner			
Partner number and short name	WP6 effort		
1 - ROT	13.50		
2 - UME	13.50		
3 - GCC	13.50		
4 - SP	31.00		
5 - ISINNOVA	2.00		
6 - AIT	10.00		
7 - TNO	10.00		
9 - EUR	8.00		
11 - US	10.00		
18 - ENE	2.00		
22 - UEAB	2.00		
25 - SPPS	2.00		
34 - SI	7.00		
Total	124.50		

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D6.1	Initial findings from the establishment of Innovation Platforms	4 - SP	Report	Public	18
D6.2	"Rich narratives" – Scenario analyses for the Lighthouse cities and recommendations	4 - SP	Report	Public	18
D6.3	Report on the Context and Critical Conditions (CCC) process and result for each light house city	4 - SP	Report	Public	26
D6.4	Summary of energy systems analysis report –conclusions from simulation for the three Lighthouse cities	4 - SP	Report	Public	30
D6.5	Plans for integration of Innovation Platforms into local innovation processes	4 - SP	Report	Public	30
D6.6	Business Models for Smart Cities- Cities –	9 - EUR	Report	Public	48

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷		
	conclusions on methods for generating bankable smart solutions						
D6.7	Innovation Platforms for Innovative cities –conclusions and recommendations	4 - SP	Report	Public	58		
	Description of deliverables						

List of deliverables

D6.1 : Initial findings from the establishment of Innovation Platforms [18]

An interim summary and conclusions on the establishment of the Platforms. The report serves as a comparative guide between the LHC's with the aim of enabling a discussion between the LHC's and other relevant consortium partners on the benefits and consequences of organisational and strategical decisions. Linked to T6.1 and approximately 30 pages.

D6.2 : "Rich narratives" – Scenario analyses for the Lighthouse cities and recommendations [18]

The deliverable encompasses (2-4) plausible alternative futures for the contextual systems common to the lighthouse cities, in a 15-year perspective. These narratives will identify key determinants (drivers, barriers, framework conditions) in the socio-political landscape, and the interaction of these with the urban innovation system with the intention to inform strategic analysis and system modelling. The 'narrative' format will combine detailed storytelling with illustrative/visual elements (graphics, presentations, etc. to be defined) to support communication of findings within the consortium.

D6.3 : Report on the Context and Critical Conditions (CCC) process and result for each light house city [26]

The report will comprise of a summary and comparison of analyses done for each LHC and will identify the main critical conditions for each city. The main outcome is an increased understanding of the socio-economic barriers to upscaling and will provide input to further elaboration of the innovation platforms in each lighthouse city. Despite having a local focus on the LHC's, general conclusions are likely also beneficial to the follower cities, either as direct input or as inspiration. The report is the result of T6.5 and will be of approximately 60 pages.

D6.4 : Summary of energy systems analysis report –conclusions from simulation for the three Lighthouse cities [30]

Report on the impact of upscaling the proposed and demonstrated technologies for the lighthouse cities. The report will point out the system effects of upscaling and will show the potential benefits of a larger deployment of the technologies in terms of decrease in CO2 emissions and system costs. Also potential negative effects such as network congestion, voltage problems, or consequences from e.g the introduction of electric vehicles in a large scale will be analyzed in the report. The analyses are context dependent and will be specific for each city. However, the report will also if possible point out generic conclusions. The report will serve as a basis for decisions on strategies for upscaling of smart solutions to a city scale. Linked to T6.4 and approximately 50 pages

D6.5 : Plans for integration of Innovation Platforms into local innovation processes [30]

Compilation of plans from each Lighthouse city on how the Innovation Platforms whould be integrated into the ordinary structures and processes of the involved partners. The plans will serve as a starting point for the ambition that the platforms are sustained after the end of the project and are harmonised with local and regional ambitions on innovation. Compilation of 3 plans and an brief reflective summary in an consolidated document. Approximately 50 pages. Linked to T6.1.

D6.6 : Business Models for Smart Cities- Cities –conclusions on methods for generating bankable smart solutions [48]

Compilation of plans from each Lighthouse city on how the Innovation Platforms whould be integrated into the ordinary structures and processes of the involved partners. The plans will serve as a starting point for the ambition that the platforms are sustained after the end of the project and are harmonised with local and regional ambitions on

innovation. Compilation of 3 plans and an brief reflective summary in an consolidated document. Approximately 50 pages. Linked to T6.1

D6.7 : Innovation Platforms for Innovative cities –conclusions and recommendations [58]

The report is a final conclusion and analysis of the work carried out in the Lighthouse cities, which covers all the local actions undertaken and the analyses performed. The report will provide a comparison between the LHC's and assess the benefits and downsides to the differnt chosen strategies. Analysis on the prerequisites for follower cities to establish Innovation Platforms or similar structures will be included. The report will contribute with findings on the capacity building aspects to urban innovation and upscaling of smart solutions. Linked to T6.1 and approximately 70-100 pages.

Schedule of relevant Milestones

Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
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Work package number ⁹	WP7	Lead beneficiary ¹⁰	5 - ISINNOVA	
Work package title	Replication to Follower cities and Knowledge transfer			
Start month	7	End month	60	

Objectives

WP7 aims to guide and support Brno, Gdansk and Parma (the follower cities) in getting ready for the replication of the smart solutions by the end of the project. This 5 years long process of empowerment seeks to fulfil the following steps in each city:

- Participate in an intensive process of capacity building and knowledge transfer, together with the other follower cities and with the lighthouse cities, in order to enable the following path:

- Assess the state of play and establish a smart city-governing group to steer the local replication efforts.

- Deploy a participatory foresight process to assist in developing a long-term Smart City Vision and a Roadmap for deployment of the vision.

- Deliver a Replication Plan of smart solutions, to roll out the implementation of the vision.

WP7 also seeks to widen the smart city perspective of the follower cities by involving in the knowledge share process the city of Portland in the USA and the city of Mumbai in India to add an external outlook to smart city projects.

Finally, WP7 actively works with the City interest Group of WP9 to inspire take-up and amplify the replication potential of the project. Finally, WP7 actively works with ICLEI's large community of cities to inspire take-up and amplify the replication potential of the project.

Description of work and role of partners

WP7 - Replication to Follower cities and Knowledge transfer [Months: 7-60]

ISINNOVA, ROT, UME, GCC, SP, AIT, TNO, ICLEI, UB, Brno, Parma, Gdansk, PIC, INF, GIWK

WP7 is entrusted with the empowerment of Brno, Gdansk and Parma in view of post-project replication of the smart solutions. As illustrated in Section 1.4, our follower cities share a strong political support and long-term commitment to replication, as well as a passionate cooperation attitude that the transnational dimension of the project shall ideally fulfil. What the follower cities need is exposure to the full range of organisational and technical competences that enable them to become lighthouse cities after the end of the project. That is where the lighthouse cities and the team of project experts come into play. The work of WP7 is closely dependant on the knowledge produced by the other WPs, and notably by:

- WP1, which distils the essence of the innovation implemented in the lighthouse cities and supplies insights drawn from the thematic discussions held with the implementation teams of Rotterdam, Glasgow and Umeå in dedicated Liaison Group Meetings once a year (see T1.2). This peer dimension is critical as it allows managers and technicians in lighthouse and follower cities to find common ground and easily relate to challenges and solutions. WP1 will additionally provide Brno, Gdansk and Parma with the opportunity to test the prototype tools and guidance for decision support and implementation of smart solutions developed in T1.3, such as the Smart Energy District Planner and the Smart City Design and Decision Platform.

- WP2, WP3, WP4, which supply field-validated information on the technicalities of the smart solutions.

- WP5, which provides hard evidence of the impacts of the smart solutions, thereby corroborating the replication choices that each follower city will make. WP5 is also in charge of evaluating the objectives and target impacts identified by the follower cities and illustrated in Section 2.1.

- WP6, which affords a perspective on the scale-up potential and the long-term sustainability of the demonstrated smart solutions, thereby supplying the follower cities with valuable guidance on how to pick technically viable and cost effective business models (see T6.2 and the Smart City Business Model Approach). Particularly relevant is the work of T6.1, which establishes Urban Innovation Platforms in the lighthouse cities to stimulate creative processes for urban development, identify key actors and stakeholders and share risks in connection to smart city projects. T6.4 will analyse the scaling and replication potential of the demonstrated lighthouse smart solutions, supplying key information to the Replication and Investment Plans of the follower cities.

- WP9, which seeks to extend, among its objectives, the replication of the lighthouse smart solutions to cities other than the follower cities (via the City Interest Group, T9.4 and the capacity building of T9.5). In this context, the follower cities will provide a range of "user-validated" information to products such as the factsheets, the results brochures and the replication pack.

WP7 accordingly deploys a structured capacity building programme that constitutes the backbone of the WP, coupled with continuing knowledge share with the other WPs to enrich the empowerment process.

The effectiveness of the knowledge transfer and training programme executed by WP7 is going to be monitored through the administration of regular surveys in which the follower cities will progressively assess the process of capacity building. Surveys will be self-administered as follows:

- At the beginning of the project to the staff involved in WP7 in Brno, Gdansk and Parma. The results will establish a reference baseline presented in D7.7 Initial Replication Assessments and passed on to WP5 for evaluation.

- After each Replication Workshop and Local Governance Workshop.

- After each local Governing Group meeting.

- After each Study Tour.

The analysis of the surveys will allow the project to assess how much and how well the empowerment of WP7 has served the replication process in Brno. Gdansk and Parma.

Task 7.1 Empower the cities through knowledge share and training (Lead: ISINNOVA; Partners: Brno, Gdansk, Parma, ROT, UME, GCC, TNO, SP, AIT, ICLEI, PIC, GIWK) [M1-M59]

Throughout the duration of WP7 the follower cities will participate in an intensive process of empowerment that is expected to supply the competencies for an informed replication of the smart solutions. T7.1 thus sustains and cuts across the other three work package tasks and avails itself of several sources of knowledge:

- Information produced by the lighthouse cities, both in terms of details on the employed approaches, business models and technologies, as well as insights supplied by peer consultation.

- Expertise provided by the research centres involved in the project, and primarily those leading WP1 (TNO), WP5 (AIT) and WP6 (SP).

- External expertise hired to deliver specific training sessions.

- Experience exchange with other cities working on smart city projects in Europe and in the world, thanks to knowledge share events organised with the rest of the SCC1 initiative (through WP8) and with ICLEI's member cities (WP9). T7.1 foresees the following sequence of knowledge share and training events:

1. A set of 6 replication workshops addressing key themes identified by the follower cities. These workshops structure and steer the empowerment and replication process as they unfold across the entire project duration. As illustrated in the WP7 flow chart, replication workshop no. 1 will to provide the follower cities with guidance on effective ways to establish and run governing groups, to comprehensively manage smart city initiatives, involving local businesses and communities and organising the work of the city administration. Although the primary target of this workshop will be municipal managers and policy makers, we foresee large benefits also for the local stakeholders, especially in overcoming mental and institutional barriers to implementation. Accordingly, local workshops will be also organised to transfer the knowledge at the neighbourhood level. Replication workshop no. 2, 3, 4, 5 and 6 will focus on technical and managerial aspects that will be identified by the practitioners of the follower cities, including members of the governing groups such as utilities, industries researchers, transport operators, etc. These workshops will also enable the follower cities to receive implementation and monitoring updates from the lighthouse cities and will provide an occasion for peer-to-peer discussion on progress, problems, solutions and results. Workshop no.6 will be the official venue for the presentation of the Replication and Investment Plans to the lighthouse cities for feedback.

2. A set of 6 local governance workshops, which will systematically unfold in each follower city after the replication workshops to transfer and take up the issues discussed thereof. The purpose of these workshops, to be held in the local languages, is to flank the city administrations during the entire process envisioned by WP7, and thus agreeing on a smart city vision, identifying a roadmap and culminating with the development of Replication and Investment Plans. These governance workshops will gather an audience of stakeholders mirroring that taking part in the meetings of the governing groups, with which they will share the participation and reporting model (see T7.2). Local governance workshop no.6 will be a momentous one as it will officially approve the Replication and Investment Plans at the presence of the Mayors of Brno, Gdansk and Parma.

3. An intensive programme of study tours, 1 in each lighthouse city (3 in total). These tours will commence once all lighthouse cities smart solutions have been rolled out and monitored for at least 1 year. Brno, Gdansk and Parma will attend with delegations of managers and technicians to be selected among the municipal staff as well as representatives from the organisations taking part in the local governing groups (e.g. politicians, citizen representatives, business leaders, media). Study tours are considered to be the most effective means of face-to-face, peer-to-peer knowledge exchange. In RUGGEDISED these visits will allow the follower cities to foster deeper engagement with the stakeholders of the lighthouse cities, to benefit from an operational, hands-on observation of the smart solutions, and to further knowledge of implementation and technical aspects. The provisional sequence of study tours is shown in the flow chart at the end of WP7 description.

4. Ad-hoc webinars, video and telephone conference calls, regularly held to address key organisational, methodological and technical issues raised by the follower cities. We expect these events to focus not only on the technicalities of the smart solutions, but also to the wide array of the enabling areas identified by the Strategic Implementation Plan of the

European Innovation Partnership on Smart Cities and Communities, and particularly on issues related to community involvement, integrated planning, standards and regulation, open data, business models and procurement. As such, these tools will enable a more flexible and dynamic knowledge exchange to be used both on-demand and as a regular progress monitoring instrument in which all follower cities come together in cohesive working group.

Because smart city approaches and projects are being developed world wide, and their diversity represents an asset for both our follower and lighthouse cities, the project has secured the external support of two leading international smart cities that will provide our cities with different perspectives on similar challenges.

The city of Portland (Oregon) in the USA will cooperate with the project by exchanging information and insights in a sequence of knowledge exchange events, which will include reciprocal study tours (to Portland in 2018, to our lighthouse cities in 2019) as well as the maintenance of a permanent peer-to-peer communication channel to enable exchange of documents and discussion on select topics through webinars and conference calls. Portland, represented by the Municipal Bureau of Planning and Sustainability and Portland State University, is keen on sharing experience on solutions responding to the goals of local Climate Action Plan, and particularly the DC grid, PV and storage for mobility (Rotterdam), the 3-D City operations model (Rotterdam), the EV charging hub in city centre car park (Glasgow), the Intelligent LED street lights with integrated EV charging, wireless communications network, and air pollution monitors (Glasgow), the Intelligent building control and end user involvement (Umeå) and the Smart Open Data city Decision platform (Umeå).

ISINNOVA as task leader will be responsible of structuring, organising and supervising the overall sequence of work package level events, and will concurrently liaise with the local partnerships in Brno, Gdansk and Parma to ensure that their local events unfold according to plans. TNO, AIT, SP and ICLEI will be called to contribute to the events as transferors of knowledge from WP1, WP5, WP6 and WP9 respectively, while Rotterdam, Umeå and Glasgow will be providing field evidence as well as peer advise.

In order to amplify the effectiveness of the approach of WP7, the work package will maintain a one-on-one assistance scheme available for each follower city throughout T7.1, T7.2, T7.3 and T7.4. This arrangement will allow for closer and more accessible support administered in the local language, will ensure the adoption of common methodologies, and will enhance the level of local activities coordination. Accordingly, Parma will be assisted by ISINNOVA, Brno by AIT and Gdansk by PIC.

Task 7.2 Assess the state of play, establish and run the smart city governing groups (Lead: ISINNOVA; Partners: Brno, Gdansk, Parma, AIT, SP, PIC, GIWK) [M1-M60]

The Replication and Investment Plans, described and presented further in T7.4, play an important role in RUGGEDISED as reference documents that the follower cities are committing to and will not substantially modify. However, the ambition and complexity of RUGGEDISED must reckon with the fluid dynamics that affect the surrounding environment and require an initial phase in which actors review the state of play and prepare for the work at hand. In T7.2 Brno, Gdansk and Parma will:

- Verify that the smart solutions demonstrated by the lighthouse cities are confirmed as described in the proposal or whether minor technical, organisational or temporal changes have been applied.

- Assess and update the local state of play regarding replication district level energy efficiency, use of renewables, smart mobility, and quality of infrastructure.

- Survey and update the urban development and renovation programmes and plans, financing opportunities, as

well as key policy and legislation frameworks affecting smart city project developments.

- Assess and update the existing stakeholder participation processes including a survey of the institutional, industrial and user/consumer groups that could be potentially involved in the governing group.

This information will be included in the Initial Replication Assessments, to be prepared by Month 12 and will be updated at Month 44, as data and insights are collected from the light house cities, and from the workshops and study visits performed (see T7.1) with an increasing focus on the planned replication activities. Support will be provided by ISINNOVA, AIT and PIC to Parma, Brno and Gdansk respectively in the development of their replication assessments. The ground setting activity of T7.2 also foresees the establishment of local governing groups. The analysis of smart city projects around the world confirms that irrespective of the size of the investments, the level of ambition, integration and complexity, prospective smart cities require a crucial organisational component, often referred to as a "smart city governance" (notably, this is one of the key findings of the 2016 Final Report of the tender "Analysing the potential for wide scale roll out of integrated Smart Cities and Communities solutions" funded by DGMOVE and assessing 80 smart city best practices worldwide). Governances ensure overall coordination, cutting across administrative silos, create public-private partnerships and pro-actively involve local communities.

To ensure that the follower cities start off on the right foot the long replication process foreseen by the project, T7.2 seeks to establish proper forms of governance in compliance with the local needs and traditions. It is important to note that this action has a twofold goal:

- Install a governing group (for each follower city) that will supervise the entire replication process in the follower cities, thereby handling the participatory steps envisioned by next task, T7.3. This body is expected to survive the project and actually steer the actual replication of smart solutions in the future as specified in the replication plans.

- Create a permanent link between the work of this governing group, which is in principle independent of the work of the project, and the project, which is a primary source of knowledge for the follower cities to tap in. This link is thus expected to ensure that the activities of the project and the rest of the relevant smart city initiatives free flowing in the follower cities are coordinated and aligned.

These groups will be formally established by M6 in all follower cities. Other partners in T7.2 will assist by reviewing the already existing forms of official coordination, supplying reference successful examples from literature, and suggesting solutions for ex-novo instalment or current arrangements improvement. T7.2 will also issue a communication protocol, prepared by ISINNOVA, to be used by each governing group to guarantee a consistent approach in facilitating the meetings and reporting on the activities.

As further discussed in T7.3, these groups will take the responsibility of co-governing with the municipalities the process of conceptualising a smart city vision, defining a roadmap for smart city implementation, possible participants and responsible, participating in the empowerment framework and finally delivering the Replication and Investment Plans. An important aspect of work of these groups is that they will not simply govern the local replication processes, but will come together in liaison groups (through their appointed representatives) in occasion of each General Assembly of the project to discuss progress, common challenges and ways forward.

Task 7.3 Deliver a vision and an implementation roadmap with participatory foresight (Lead: AIT; Partners: Brno, Gdansk, Parma, ISINNOVA, PIC, GIWK) [M7-M39]

The project believes in the importance of nestling the follower cities' Replication and Investment Plans within broader and long-term smart city visions. To this end, WP7 proposes to utilise a participatory foresight process in order to create shared strategic visions and roadmaps for the organisation of upcoming investments in the energy and mobility sectors. Participatory foresight allows strategic planning to break small organisational silos, overcome institutional inertia, and avoid sporadic action. It effectively establishes a collaborative forecasting platform that is able to channel the oftenfragmented energy and intelligence present in our communities to design a concrete way forward. The approach seeks to bring together institutional, technical, economic, ecological and societal stakeholders to perform a prospective analysis to create the shared vision of the future smart city (the strategic vision), as well as a mid-term tactical decision-making to accomplish that vision (the roadmap).

The approach is increasingly used in EU projects and in planning efforts at national and local level. WP7 counts on specific expertise that can be places at the follower cities' service, such as ISINNOVA ,AIT and PIC. ISINNOVA coordinates several foresight projects at the EU level (e.g. Fresher, an on-going foresight analysis of the future global burden of chronic diseases in the EU and their impact on health care expenditures, on population well-being, and on health and socio-economic inequalities, or Flagship, a just concluded analysis of the state-of-art of forward looking methodologies to develop an innovative framework supporting the European policies in addressing grand societal challenges, and namely the future European environmental, social and economic and governance challenges). AIT is supporting the participatory foresight processes of several local administrations in Austria, guiding them in the establishment of soft governances to deal with complex and unpredictable transformation patterns in an adequate, sustainable and result-oriented way (e.g. City of Villach). PICTEC has experience in technology assessment and consulting in the domain of urban development, and has conducted foresight and planning activities for Gdansk Tourism Organization, city of Gdansk, and supported regional authorities in preparation of Smart Specialization Strategy (S3) for the Pomerania Region (2014-2015).

In T7.2 the governing groups established in T7.3 will gather the diverse range of local stakeholders to: a) review the often dense strategic documents already delivered, b) discuss the likely, possible, or even just thinkable futures of their cities, c) understand and integrate the different roles and perspectives of the involved stakeholders, and d) deliver (or improve, adapt, depending on the individual case) the smart city vision and the roadmap for implementation.

These actions will be performed from M7 to M39 by the follower cities in close cooperation with ISINNOVA, AIT and PICTEC, keeping in mind that each participatory foresight process will be tailored to the specific local requirements in terms of objectives, available resources and expertise, existing planning techniques and documents. In order to consolidate a guiding participatory foresight methodology, a specific workshop will be held in which AIT, ISINNOVA and PIC will come together to share and fine-tune a common conceptual framework.

Task 7.4 Deliver the replication and investment plans (Lead: ISINNOVA; Partners: Brno, Gdansk, Parma, AIT, TNO, SP, ICLEI, GIWK) [M7-M59]

T7.4 will conclude the replication trajectory of the follower cities with the delivery of individual Replication and Investment Plans, whose current synthetic versions are shown in Section 1.4.4, 1.4.5 and 1.4.6 and in Annex A. The 5 years of project work will enable Brno, Gdansk and Parma to effectively improve, update and detail these plans in view of adoption and deployment as of 2022 (the post-project phase). The next flow chart illustrates how the four work package tasks unfold and interact in leading the follower cities to their end project goal. Dates are indicative and will be firmed up at project outset.

Inputs (from):

- WP1: Peer-to-peer discussion in Liaison Group meetings on organisational, financial and technical issues

- Prototypes: Smart Energy District Planner and Smart City Design and Decision Platform
- WP2: Field validated information on demonstrated smart solutions
- WP3: Field validated information on demonstrated smart solutions
- WP4: Field validated information on demonstrated smart solutions
- WP5: Methodology for objectives and impacts monitoring and data collection
- WP6: Insights on scale-up potential and the long-term sustainability of the demonstrated smart solutions
- Use of Smart City Business Model Approach and feedback from Urban Innovation Platforms

Insights on scaling and replication potential of the demonstrated smart solutions

WP8: Insights provided by the lighthouse and follower cities of the other Smart City projects

WP9: Interaction with the City Interest Group

- Outputs (to):

- WP1: Testing of prototypes

- WP2: Knowledge share on smart city organisational aspects where the follower cities are proficient

- WP3: Knowledge share on smart city organisational aspects where the follower cities are proficient

- WP4: Knowledge share on smart city organisational aspects where the follower cities are proficient

- WP5: Baseline and regular monitoring for the assessment of the effectiveness of capacity building in follower cities

WP6: Test of Smart City Business Model Approach and feedback to Urban Innovation Platforms

WP8: Insights provided to the lighthouse and follower cities of the other Smart City projects

WP9: User-validated information to factsheets, the results brochures and the replication pack

Participation per Partner			
Partner number and short name	WP7 effort		
1 - ROT	0.50		
2 - UME	0.50		
3 - GCC	0.50		
4 - SP	2.00		
5 - ISINNOVA	43.00		
6 - AIT	14.00		
7 - TNO	2.00		
8 - ICLEI	2.00		
12 - UB	25.00		
13 - Brno	47.00		
14 - Parma	47.00		
15 - Gdansk	37.00		
28 - PIC	14.00		
30 - INF	18.00		
33 - GIWK	13.00		
Total	265.50		

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷	
D7.1	Initial Replication Assessments	5 - ISINNOVA	Report	Public	19	
D7.2	Visions and Roadmaps	5 - ISINNOVA	Report	Public	39	
D7.3	Intermediate Replication Assessments	5 - ISINNOVA	Report	Public	44	
D7.4	Replication and Investment Plans	5 - ISINNOVA	Report	Public	59	
D7.5	Reports from the Governing Groups meetings	5 - ISINNOVA	Report	Confidential, only for members of the consortium (including the Commission Services)	53	
D7.6	Reports from the technical workshops	5 - ISINNOVA	Report	Confidential, only for members of the consortium (including the Commission Services)	57	
D7.7	Lessons learned on replication for wide uptake	5 - ISINNOVA	Report	Public	60	

List of deliverables

D7.1 : Initial Replication Assessments [19]

The report provides an assessment of the initial state of play in Brno, Gdansk and Parma in order to: a) confirm that the smart solutions demonstrated by the lighthouse cities are as described in the proposal or whether minor technical, organisational or temporal changes have been applied; b) assess and update the local state of play regarding replication district level energy efficiency, use of renewables, smart mobility, and quality of infrastructure; c) survey and update the urban development and renovation programmes and plans, financing opportunities, as well as key policy and legislation frameworks affecting smart city project developments; d) assess and update the existing stakeholder participation processes including a survey of the institutional, industrial and user/consumer groups that could be potentially involved in the governing group.

D7.2 : Visions and Roadmaps [39]

The report illustrates the process and the final outcomes of locally-adapted participatory foresight approaches in Brno, Gdnask and Parma to: a) break through small organisational silos, overcome institutional inertia, and avoid sporadic action; b) effectively perform a prospective analysis for the development of a shared smart city vision (the strategic vision) and a mid-term tactical decision-making to accomplish that vision (the roadmap).

D7.3 : Intermediate Replication Assessments [44]

The report provides an update on the initial replication assessment, in light of the data and the insights thus far produced by the light house cities, and thanks to the knowledge accumulated by Brno, Gdansk and Parma through the workshops and study visits performed as per the work plan.

D7.4 : Replication and Investment Plans [59]

The report illustrates in details the individual Replication and Investment Plans of Brno, Gdansk and Parma, which effectively conclude 5 years of work in the project in view of adoption and deployment of the selected smart city actions as of the year 2022 (the post-project phase).

D7.5 : Reports from the Governing Groups meetings [53]

The report illustrates the process of formation, the modus operandi, an account of the main activities, barriers and solutions related to the Governing Groups operating in Brno, Gdansk and Parma throughout the life of the project. Whilst packaged in a single final report, D7.16 avails itself of regular internal reporting (approximately at M11, M18, M25, M35, M41, M49, with deliverable numbers: D7.2, D7.4, D7.7, D7.9, D7.11, D7.14) in order to trace possible trajectories and provide hands-on insights to other interested replicating cities.

D7.6 : Reports from the technical workshops [57]

The report illustrates the process and the otcomes of the knowledge share and training programme set out by the project (replication and governance workshops, study tours). The capacity built through these events, as well as the barriers and solutions Brno, Gdansk and Parma came across, will be described in a single final report (D7.15) based on regular internal event reporting (approximately at M9, M16, M23, M33, M47, with deliverable numbers: D7.1, D7.3, D7.6, D7.8, D7.13) in order to trace possible trajectories and provide hands-on insights to other interested replicating cities.

D7.7 : Lessons learned on replication for wide uptake [60]

The report provides a glance of the repliction trajectory sustained by the project with substantial focus on handson insights delivered by Brno, Gdansk and Parma. The report is expected to be released in the form of a Handbook presenting synthetic "dos and don'ts" in relation to key replication steps followed by the project to the benefit of other interested replication cities.

Schedule of relevant Milestones

Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
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Work package number ⁹	WP8	Lead beneficiary ¹⁰	1 - ROT
Work package title	Interaction wi	th other Smart City projects	
Start month	1	End month	60

Objectives

WP8 is expected to enhance the implementation and replication potential of RUGGEDISED, as follows:

- Allow for knowledge and progress exchange on all key smart city aspects, including technical, financial, legal and organisational issues. This bi-directional flow will enable our lighthouse cities to compare, strengthen and validate the concepts driving their smart solutions, learning in particular from the lighthouse cities that have started their projects in SCC1 2014 and 15 and in FP7. Conversely our lighthouse cities will pro-actively make available their local knowhow for other cities to learn from and adapt.

- Expand the knowledge base accessible by our follower cities, which will result in more effective capacity acquisition and more grounded Replication and Investment Plans.

- Build and/or consolidate international relationships with peer smart cities, expanding exposure to good practice and potentially helping to establish future partnerships for additional EU funding.

Description of work and role of partners

WP8 - Interaction with other Smart City projects [Months: 1-60]

ROT, UME, GCC, SP, ISINNOVA, ICLEI, US, BN, UNR

This work package will make sure all relevant information – including unsolved issues and questions arising during the project - from RUGGEDISED is being transferred to the group of smart city project experts (a group of 200+ experts from all over Europe active in running H2020 Smart City projects). At the same time this WP enables RUGGEDISED to use the information from other projects and include it in the RUGGEDISED project. To this end the Chief Operations Officers of all three cities will engage in the exchange, as well as expert staff of the cities.

The three organisations that will play a central role in this are ICLEI, the programme management group (ROT, AIT and UNR) and ISIS. In addition, the Chief Productivity Officer (CPO) of the three lighthouses will be involved to provide information and expertise where needed. They are the ones that spot opportunities and identify weaknesses and that bring together the effected stakeholders in the districts.

Task 8.1 Contribution to the development of information material such as newsletters, videos, images etc., as well as inputs to European portals and databases in the quality and form specified (Lead: ICLEI) [M1-M60]

Purpose: To provide a clear structure for communication between SCC1 projects and to provide a coordinated approach towards internal communication activities

- Add links to related projects on the website
- To share an events calendar
- Annual 'smart city' event (date and time and place to be defined together with ICLEI Global)
- Combined launch of dissemination material, invite key stakeholders

Task 8.2 Identification of market barriers (Lead: UNR/ROT/UME/GCC) [M1-M60]

In WP1 Liaison Groups are set up. Within these groups, issues are arising that are important to the implementation.

The Smart Energy and E-mobility Liaison group will discuss among other thigs:

- the implementation and impacts of the smart energy measures, including e-mobility

- monitoring results on energy and e-mobility

- the integration into the local energy system and choices related to that,

- possible barriers and solutions

The ICT Liaison group will discuss:

- monitoring results on ICT-solutions

- data protocols, interoperability of the Smart City Design and Decision Platform, privacy issues,

- issues related to data upscaling from building to district and GIS-level

- openness versus partly closedness of the Platform related to privacy issues; level of detail of the open data related to privacy issues;

- progress on the Smart City Design and Decision Platform, barriers, and solutions

The Innovation and Business modelling Liaison Group will discuss:

- the progress in the Local Innovation Platforms in the Lighthouse Cities and issues raised there;

- monitoring results on innovation and business modelling

- multi-actor financial arrangements;

- new innovative business models;

- opportunities for local entrepreneurs and new jobs.

All the issues above and many more (legal, regulatory and other market barriers) will give rise to questions and further needs. Best practices can best be sought via the network of smart city experts established in Brussels already. The people actually working on the smart solutions will meet during the liaison groups. Depending on the agenda setting in Brussels, the appropriate person will be sent to the meetings.

Task 8.3 Delivery of an update/further input of the project's contribution to the SCC1 Initiative, such implementation progress, technical advancements, evaluation methods, replication approaches, etc. (Lead: ISINNOVA) [M-M]

- To coordinate tri-annual teleconferences with the Project Coordinators replication leaders and D&C responsible partners from other SCC1 projects to identify key opportunities for linking up. This involves conference set up, agenda making, minute taking and dissemination of minutes.

Identify key communication contacts and set up collaborative working tools to share information about project updates.
Identify technical solutions being implemented in other projects and enable technical exchange between WP leads on implementation.

- Link in with European level platforms e.g. SCIS and EIP

Outputs:

- Delivery of agreed presentation materials and media tools.

- Participation in events, such as contractor's workshops, conferences etc.

Participation per Partner

Partner number and short name	WP8 effort
1 - ROT	5.00
2 - UME	5.00
3 - GCC	5.00
4 - SP	0.50
5 - ISINNOVA	5.00
8 - ICLEI	5.00
11 - US	0.50
16 - BN	0.50
29 - UNR	4.50
Total	31.00

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D8.1	First version SCC1 Database (combined calendar, dissemination	8 - ICLEI	Other	Public	18

	List of deliverables						
Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷		
	material, useful links) One per task!						
D8.2	Report from the Liaison groups on implementation needs	29 - UNR	Report	Public	48		
D8.3	Report on project contribution to the SCC1 initiative	5 - ISINNOVA	Report	Public	48		
		Description of dolivor	rablaa				

D8.1 : First version SCC1 Database (combined calendar, dissemination material, useful links) One per task! [18] The project database will contain the dissemination material that is produced by the project activities. It will contain the most relevant links to websites and information sources such as related projects and it will contain the inputs to the various (e.g. European) portals and databases in the quality and form specified.

D8.2 : Report from the Liaison groups on implementation needs [48]

For the project, liaison groups are set up. These groups periodically discuss issues that are relevant to the implementation. The output of the Liaison Groups is collected and stored for dissemination use.

D8.3 : Report on project contribution to the SCC1 initiative [48]

The project contribution to SCC1 (e.g. presentation materials, media tools, overview of participation in events, workshops and conferences) is collected and included in a report.

Schedule of relevant Milestones

Work package number ⁹	WP9	Lead beneficiary ¹⁰	8 - ICLEI
Work package title	Communication	on and Dissemination	
Start month	1	End month	60

Objectives

The Communications and dissemination is seen as to be the cornerstone of the RUGGEDISED project, and a good opportunity to showcase the valuable work that is being funded by the European Commission and make this visible at a European, national and local level, in particular to the citizens, who are directly impacted by the project. This WP should also strategically support the overall success of Horizon 2020 in profiling the sizeable and positive impacts of the project economically (through implementation of new measures, and the opportunity for industry partners to profile their solutions), socially (impacts of measures on citizens and potential job creation and environmentally (reduced GHG emissions). As such, a significant proportion of the budget has been dedicated to the Lighthouse and Follower Cities as well as travel budget to cover transits to events, workshops and conferences.

The communication objectives for the RUGGEDISED project are built on, and take into account, the overall project objectives. This WP is designed to work in close cooperation with other WPs over the lifespan of the project.

- Complement the in-depth individual city replication and deployment activities.

- Support wide-scale deployment part of the smart solutions and the integrated approach.

- Promote direct exchange and learning between stakeholders across Europe.

Description of work and role of partners

WP9 - Communication and Dissemination [Months: 1-60]

ICLEI, ROT, UME, GCC, SP, ISINNOVA, AIT, TNO, EUR, UU, US, UB, Brno, Parma, Gdansk, BN, RET, ENE, KPN, AHAB, VCC, UEAB, UPAB, TS, SPPS, TCB, SIE, PIC, UNR, INF, FI, WG, GIWK, SI

The large scale of the project and five-year duration of the project means a high-level of strategic coordination is necessary to ensure that all activities from events, feedback for various products, logo collection, updates to promotional tools (e.g. due to rebranding), dissemination of project results to the intended audience which highlight the benefits of Europe-wide collaboration and the positive impact it can have on our everyday lives, are effectively linked up and are consistent to optimise visibility. As such, there is a strong emphasis on a coordinated approach to maximise outreach across all networks and communication channels.

Task 9.1 Communication and Dissemination Secretariat (Lead: ICLEI; Participants: Lighthouse & Follower Cities) [M1-M60]

Purpose: To provide direction to enable clear and consistent external communications through the set-up of a robust structure and clear communication processes.

The Communication and Dissemination secretariat will:

- Strategic communication meetings with local dissemination manager

- Information management

- First point of contact for enquires from external stakeholders

- Contribute, upon invitation by the INEA, to common information and dissemination activities to increase the visibility and synergies between H2020 supported actions.

Subtask 9.1.1: Strategic communication meetings

ICLEI will chair a Dissemination Coordination Group (DCG) to coordinate communication and dissemination activities between RUGGEDISED at a European level and the Lighthouse Cities (task 9.7) and Follower Cities local / national level activities. ICLEI will be responsible for setting the date, the agenda, and taking minutes noting actions as necessary. These, in addition to other information and resources (information management tools described below, promotional materials, press releases) will be continuously shared on a dedicated internal work space. ICLEI will hold annual physical meetings/ workshops (Subtask 9.9.4) at the RUGGEDISED Project Meetings (WP10). Mini reports produced under task 9.9 will be presented here. These telco/physical meetings will be an opportunity to propose content for the e-update, give brief updates on recent communication activities, and explore synergies for common dissemination activities across projects. ICLEI will ensure that all DCG members are aware of the various communication channels to maximise visibility for their activities.

Subtask 9.1.2: Information management

ICLEI will set-up and maintain of a thorough list of key stakeholder groups, media contacts for targeted communications and comprehensive list of dissemination channels (including mailings lists, websites etc belonging to partners) to maximise outreach.

- Events coordination: ICLEI will draw up a list of third-party smart events (link in with WP8) and share these with project partners highlighting key events where attendance is desirable.

- Develop key media partnerships at a European and national level.

- Internal tri-monthly mailings to support communication and dissemination work among all partners. Includes key project milestones, any PU deliverables to disseminate and upcoming smart city events.

- Shared timeline: will be set up and maintained by ICLEI and shared with project partners to coordinate communication activities in the different lighthouse cities and milestones for communication purposes.

- Contribute, upon invitation by the INEA, to common information and dissemination activities to increase the visibility and synergies between H2020 supported actions.

Subtask 9.1.3: First point of contact for external enquiries

The media strategy, outlined as part of the communications strategy (task9.2) and the visibility of the project through a broad communications mix would, we hope, generate considerable interest from both media partners and other stakeholders. Being able to respond to these in a timely manner and also to build new relationships making this more or a - enable a more proactive rather than reactive approach.

Task 9.2 Dissemination and Communication strategy (Lead: ICLEI; Participants: WP leaders) [M1-M6] Purpose: To provide the strategy (overall direction) and tactics (specific activities) for delivering effective dissemination using a targeted channels and an appropriate communications mix.

Subtask 9.2.1: Dissemination and Communication Strategy

An in-depth Communications Strategy (D9.1) will clearly outline RUGGEDISED's systematic approach to reaching out and communicating to its target audience and the actions it wants them to take (i.e. uptake of the smart solutions and transitioning towards smart city development). The strategy will segment the audience (target groups in terms of policy-makers, city practitioners, industry and citizens) and present the channels used to best reach them. In line with the objectives of this WP, the strategy will identify activities to ensure that the development and the results of RUGGEDISED reach the intended audience; show how the outcomes are relevant to everyday lives; explain how European collaboration has achieved more than would have otherwise. The strategy will also reply to the following questions: What to communicate, to whom and how? It will present key messages and objectives (what); introduce target audience (to whom); and present tools and techniques on how to best communicate key messages to the specific target audience (how).

An internal mid-term evaluation of the Strategy, to determine whether the messages, channels and tools are effective or if they need to be adapted, will be carried out and any realignment necessary will be implemented for the final half of the project and reflected in the update of the Strategy. The mid-term strategy will be based on feedback that will be invited through all communication tools and individual comments, as well as from feedback collected by partners, on the success of their individual communication activities (though an excel template that ICLEI will develop and share with partners for completion every six months). The strategy will set out clear indications for the eventual re-alignment of communication efforts for the next project period, if needed. The document, which will count on input from all partners, will also be accessible to them as all the other internal material.

Both Lighthouse Cities and Follower cities will play a strong role in the implementation of the strategy to ensure high visibility and exchange of good practice. The Communications Strategy will also include details on RUGGEDISED's media approach and how specific activities like the City Interest Group will be promoted.

Subtask 9.2.2: Promotional pack & elevator pitches (short key messages)

ICLEI will develop a promotional pack to indicate ways in which RUGGEDISED project partners can help profile the project through their dissemination activities, by providing short elevator pitches about the project, based on the key messages to ensure consistent messaging. This pack will also serve to promote the launch of the project primarily through digital media. This includes the preparation of a short news item, tweet text, email to mailing list, and graphics materials. The promotion pack is designed to support the cross-linking process, described in Subtask 9.4.1 and ensure that RUGGEDISED is profiled highly on search engines from the start. All partners have budget to support these activities and are expected to produce evidence of their activities in this regard as part of reporting. Task 9.3 Visual identity, promotional tools and translation (Lead: ICLEI; Partners: All partners) [M1-M12] Purpose: To raise the profile of RUGGEDISED project, boost Search Engine Optimisation and increase outreach with key stakeholders.

Subtask 9.3.1: Corporate identity design

An attractive, modern and authoritative visual identity (D9.3) reflecting the ambition of the RUGGEDISED project and the messages it wants to send will be created as part of this task and applied across all of the project's communications platforms and products. This logo will be made available in various sizes and formats on the internal working space for use by project partners.

• Word, PPT, report and letter template will use be designed to give a consistent look and feel across the project and will be used to present deliverables at internal and external events.

• Branding guidelines for partners to maintain overall visual identity should they be producing any products locally e.g. for citizen engagement events

Subtask 9.3.2: Supporting promotional materials

A suite of communication materials will be produced by ICLEI to provide further information about the project and strengthen brand recognition among stakeholders. The materials for use by all project partners to disseminate at events and networking opportunities and will guide readers to the website, through a QR code and/or a short web address. These will be designed a professional designer in line with visual identity and EU requirements.

• Business cards, easy for partners to carry with them and to promote the project at events, opportunity-based and on demand.

• Promotional brochure (in digital and print) (9.6) this will be produced in Indesign Format, with a standard layout including info about the project and one page for each city to highlight local activities.

• Standard presentation & Linkedin pitch about the project will be produced for use at local, national and international meetings and conferences.

• Roll-up banner/pop-up stands & poster will be developed to ensure a good level of visibility of RUGGEDISED at events and communicate the key elements of the project at a glance.

• Other ad hoc support e.g. in terms of brand consistency, any unforeseen items which would be beneficial in the promotion of the project.

Subtask 9.3.3: Translation

Key communication materials e.g. the RUGGEDISED brochure, short PPT for the press corner, website (key pages), logo & translated tagline in 6 languages: English, German, Dutch, Italian, Swedish and Polish. The aim behind this task is to ensure the project effectively reaches towns and cities from beyond the consortium country demographic. Previous projects have shown a proportionally higher number of unique visitors, and download, where the website has been offered in multiple languages. The translation process involves several steps including: commissioning text (quote, request, follow-up), embedding and correctly formatting text in design document templates and creating additional pages for the website for each of the languages.

Task 9.4 Traditional and digital media outreach, scientific publications and e-updates (Lead: ICLEI Input: All partners) [M1-M60]

Purpose: To disseminate the project findings through one-way communication activities via project-owned, specialist as well as popular media outlets.

Subtask 9.4.1 Website

The home of RUGGEDISED will be its website www.ruggedised.eu. It will host an overview of the RUGGEDISED project, city pages showing where the measures will be implemented, the smart solutions and engagement opportunities for cities, industry and other stakeholders e.g. registration for study visits, product demos. It will also look at options for hosting the Smart City District Planner (D1.6). Dynamic content includes: blog updates from the Lighthouse Cities, upcoming smart city events where RUGGEDISED is participating, and results publications related to the project e.g. factsheets, reports, business models (D3.1-3.1) guidance (e.g. D1.7, 2.7) s etc. Particular care will be taken to ensure that all RUGGEDISED content is easily accessible and clearly presented on mobiles devices such as tablets and smart phones.

The website will also link to other Smart City projects and platforms (e.g. SCIS, EIP Market Place Smart Cities and Communities). The structure of the website will be designed to ensure usable navigation, and strong SEO practices in

order to offer an intuitive, attractive, user friendly and visible first information point for the project and its users. The design will sit in line with the visual identity described above.

Subtask 9.4.2 Social media

RUGGEDISED will utilise social media channels such as Twitter and YouTube, and other digital methods - such as blogs, videos, photographs, podcasts - to communicate the project results and activities. These will be managed by ICLEI. Twitter will be the main channel to quickly disseminate RUGGEDISED news on a daily basis in parallel with the website, as well as informal points of contact for enquiries or feedback. Links will be made with social media Lighthouse City accounts (see task 9.7.3), other important initiatives and harness the reach of existing social media channels created by other Smart City projects and platforms (as above), and the RUGGEDISED network partners, which have many followers. The aim is to effectively communicate news to as wide an audience as possible. Specific guidelines and a content calendar will be prepared to define what is shared, as well as how and when. A Flickr account will store and categorise images from each of the three Lighthouse Cities (see task 9.7.3) which will be used for the project brochure, blog posts and results publications. ICLEI will keep track of the impact of content uploaded to the social media channels to understand what topics stimulate discussion and what content encourages users to follow RUGGEDISED.

ICLEI will be responsible for managing the various RUGGEDISED social media accounts. All RUGGEDISED partners will be made aware of social media content from RUGGEDISED and asked to share content as appropriate. For specific project milestones, RUGGEDISED partners will be requested to give extra promotion.

Subtask 9.4.3 Video series and product demos

A series of short promotional and professionally made videos will be developed and disseminated through a YouTube account which will be set up by ICLEI on behalf of the project. These will be used to draw attention to the project via digital media channels and will be made available to partners as downloadable mpg files for use at external events. One video diary per Lighthouse city will be produced, including footage from the implementation process of measures in a city. In addition, four video interviews will be produced with policy-makers and practitioners on their experiences with measure implementation. The videos will inform the Smart City community about the process of measure implementation in cities, inform other cities and experts about the main aims of RUGGEDISED and the advantages of getting involved, and show the international community the work done by RUGGEDISED and inspire participation/similar activities beyond Europe.

Branding guidelines for Lighthouse cities will be produced by ICLEI Europe to ensure consistency. These videos should also be available in English and ICLEI will transcribe the text to produce English subtitles. Translations may be done by the Lighthouse Cities for their local site (Subtask 9.7.2).

Subtask 9.4.4 RUGGEDISED blog and e-update

RUGGEDISED will publishing a tri-annual e-update. Sections will include blog updates from the RUGGEDISED cities, press articles and upcoming events. The blog updates will be written by the sites managers in each of the Lighthouse Cities following editorial guidelines produced by ICLEI. The blog will be split into three sections reflecting the three action areas on energy, infrastructure and transport and will be a maximum of 1000 words in length. These will inform the 'Lessons learned on implementation of smart solutions in Lighthouse Cities' (D1.2). Blog posts will each include pictures (supplied by the cities) and links to the relevant solutions which are described in detail on the website subtask 9.4.1 and the factsheets see subtask 9.6.3.

The e-update will be edited and proofread by ICLEI's professional editorial staff of native English speakers. The eupdate will be distributed via Mailchimp, which enables detailed reporting on the number of emails opened and links clicked, and sharing of email content on social media. Mailchimp will also be used to send other direct mailings from RUGGEDISED. ICLEI will at the end of RUGGEDISED conduct an analysis of the recipients' handling of RUGGEDISED mailings to evaluate the success of the project communications. Readers will be able to share the content easily over social media.

Subtask 9.4.5 Media (refers to press releases, live chat and press pack)

ICLEI will prepare a strategy, as part of the overall communications plan, for outreach to general and specialised media, so that opportunities are identified and planned for, and mutual support is established. Press releases and media relations will be sent in advance of RUGGEDISED events and other occasions where wider visibility is a benefit. The RUGGEDISED press pack on the website will be updated and include:

• all RUGGEDISED e-updates (see task 9.4.4)

• at RUGGEDISED press releases sent during the project lifespan, e.g. announcements and major conclusions of RUGGEDISED workshops, the launch of the project and the City Interest Group, etc.

• selected stock images for use by journalists

• the 'PPT' about the project in various languages (see task 9.3..2)

• Media contact information

ICLEI will ask DCG members to notify their media contacts about the resources on the RUGGEDISED website, to set the larger context for any media coverage of their activities.

RUGGEDISED will also publish articles on (intermediate and final) results in specialist city, transport, energy and building infrastructure magazines such as Cities Today, Eurotransport, Thinking Highways, European Energy Innovation, Energy Efficiency: Business & Industry Magazine, etc. Through its direct involvement on the editorial board of Cities Today magazine, ICLEI will seek to secure coverage of RUGGEDISED through related articles or interviews, focusing on the measures being implemented in the Lighthouse Cities. Published articles will also be disseminated via the RUGGEDISED digital media channels and included on a regular basis in the well-established and widespread communication channels of the respective network partners involved in RUGGEDISED.

ICLEI will lead the task. Lighthouse and Follower Cities will support with contributions to commissioned articles and outreach to their media contacts, and promote RUGGEDISED results in their own respective magazines/e-updates.

Subtask 9.4.6 Journal articles

The new scientific evidence and implications for policy and planning will be published in the form of scientific peerreviewed papers. In order to reach a vast audience of researchers in various disciplines, journals will be selected carefully to include all relevant topics, including urban design, town planning, transportation, energy, public and community, environmental science, environmental policy and management, economic valuation and informatics, etc. National journals addressed to professionals working in the policy-area will also be selected.

The scientific publications produced within RUGGEDISED will be open accessed and freely available, in order to maximize the exploitation and impact potential of the project. Both 'gold' and 'green' open access models will be considered. (more details can be found on p68-69 of the DoW)

Task 9.5 Cross-fertilisation between cities and business (Lead: ICLEI Input: All partners) [M1-M60] Purpose: To disseminate the project findings through two-way communication activities via project-owned, specialist as well as popular media outlets

Subtask 9.5.1: City Interest Group

To expand the deployment and replication of smart measures implemented in the Lighthouse Cities beyond the group of Follower Cities, a City Interest Group will be established with the aim of recruiting up to 20 additional cities to closely follow activities within the Lighthouse and Follower Cities. ICLEI Europe will manage this group and the associated promotional activities. A concept note in the form of a short 5-page PPT will be written to clearly outline the role and benefits of the City Interest Group. This together with a tailored sign-up form will be made available on the project website. A proactive communication strategy to raise awareness about the opportunity for involvement include: mailings to ICLEI's membership and extended network, presentation at external events by all partners and articles/ interviews through media publications (task 9.4.1).

A special emphasis will be placed on engaging with the members of the City Interest Group in a way e.g. through the study visits to enable a proactive approach for city officials in bringing home replication at a local level. Budget has been set aside to support travel costs of the CIG members.

Subtask 9.5.2: City-to-city study visits

ICLEI will support Lighthouse Cities to organise/provide city-to-city study visits (max. 2 per year) in terms of the programme. These would be open principally to the City Interest Group, but other cities may also register their interest via an online form on the project website. City delegations would be responsible for their own logistics and travel costs and must ensure that they bring at least one journalist to cover this exchange/ or ensure that an article is published in the locally.

Task 9.6 Capacity building & exploitation (Lead: ICLEI Input: All partners) [M1-M60] Purpose: To disseminate the project findings through one/two-way communication and capacity building activities

Subtask 9.6.1: External third-party events (Task leader: ICLEI Europe)

ICLEI would in its role as the communications secretariat coordinate the attendance of RUGGEDISED at targeted smart city events and conferences that take place during the European political calendar where they can promote the project, its achievements and its products. Attendance at events will be divided among project partners with budget allocated specifically to the Lighthouse and Follower Cities, with Rotterdam as the Coordinator expected to take a strong role. ICLEI will select the most appropriate events over a 12-month cycle and allocate a project partner to be responsible for making contact with the event organisers and ensuring RUGGEDISED is represented.

Key events targeted towards city practitioners and researchers, with some policy makers as well working in the area of smart technology and city development include: Metropolitan Solutions, Sustainable Energy Week, Sustainable Green Buildings, and Smart City Expo in addition to events organised by other European Smart City projects. However events promotion will not be limited to those events for which RUGGEDISED is covering travel, a small amount of budget has been attributed to ensure that all partners also promote the project through their organisational events in an active way either through panel discussions, presentations or informational stands.

Subtask 9.6.2: European workshops (project owned)

ICLEI will organise two stand-alone workshops focused on the European policy level (likely in Brussels) aligned with European smart city events (WP8) and five RUGGEDISED workshop sessions within relevant existing Smart City events. The former may be hosted as part of ICLEI's Breakfast@Sustainability series at their offices in Brussels to keep costs to a minimum while maximising outreach through an established event series.

The RUGGEDISED workshop sessions (five in total) will be organised by ICLEI – targeting up to 50 city representatives and other relevant stakeholders at national, regional and local levels. In terms of content, these workshops will be aligned the "Smart City" action areas and will provide an opportunity to showcase the experiences of the Lighthouse and Follower cities together with reactions from other stakeholders e.g. industry partners and representatives from other Smart City Projects. There will be a strong focus on interaction and peer-to-peer exchange with city counterparts. Efforts will be made to find innovative ways of documenting these workshops so that the information gleaned can be shared more widely.

Subtask 9.6.3: Factsheets

Factsheets provide a concise, yet informative tool to share information. For those wishing to find out more technical and detailed information about the smart solutions a series of factsheets will be produced by site managers in WP2-4 together with industry partners. These are designed to share in detail the benefits of the 12 solutions in an easily accessible way. In terms of developing and disseminating them, the following steps are involved:

• A design template for the factsheets will be produced as part of Task 9.3 to ensure that these are presented in a clear and consistent way.

• The content guide is to ensure that communications texts, material, and publications meet high standards while also being accessible to non-native English speakers.

• A reduced template and content guide will be delivered by ICLEI to the site leaders, who are responsible for collating and returning the completed versions.

• The text will be edited and proofread by ICLEI's professional editorial staff.

The text will be embedded by ICLEI into the templates and then uploaded onto the project website for dissemination.
Factsheets will then be promoted through website cross-linking and will be included in the e-update as well as through

other project communication channels.

Subtask 9.6.4: Public deliverables promotion strategy (Task leader: ICLEI)

WP leaders will write a number of publications encapsulating the outputs of their activities. Rather than listing deliverables on the website, as is often the case in project work, ICLEI will work collectively with responsible project partners (across all WPs)to outline a strategy and timeline for promotion of public deliverables. This includes producing bite-size highlights for digital channels, appropriate categorisation and display on the project website. Where possible, Infographics, in line with the project branding, will be produced to visualise key statistics in an appealing way.

This task will input into the publications schedule outlining what (e.g. fact-sheets, briefing papers, reports) is to be produced and when, including detailed information on format and layout. Selected publications may also be translated into other languages (3 or 5 depending on the purpose of the publication and remaining resources permitting). A template document will be produced by ICLEI and sent to partners to fill in. All publications will adhere strictly to the visual identity standards to ensure brand recognition. All written content will avoid jargon and use clear and plain language enabling all audiences (including non-experts) to understand the project and its successes. The printing of these materials will be organised as part of this WP, if there is budget remaining from the promotional materials subtask. RUGGEDISED will put an emphasis on online promotion and therefore the amount of printed copies will be minimised.

Subtask 9.6.5: Teaching cases: developed by EUR to document the lessons learned in the Lighthouse cities. Teaching cases can be used in higher education programs, such as master and MBA programs, but also in more specialised programs aimed at professionals (from business and government) in the field of smart city development. EUR has a specialised centre on case development within our business school that we could involve, see https://www.erim.eur.nl/ erim-centres/case-development-centre/

Subtask 9.6.6: Results publication

Towards the end of the project, a brochure will be produced to present key results from the project. Print, design and translation will be managed by ICLEI.

This will be accessible, via the website, as a downloadable document and will be disseminated via the CIVITAS, partner and extended network's communication channels.

Subtask 9.6.7: Replication pack

ICLEI will coordinate and supervise the design and production of D1.8 'Guide on ruggedized implementation and innovation of smart solutions' in a user-friendly format i.e. electronic format and web-content. This will be accessible, via the website, as a downloadable document and will be disseminated via the CIVITAS, partner and extended network's communication channels.

Subtask 9.6.8: Program lessons tailored to professionals in the field of city development will be developed. In this program lessons learned in the project will be combined with theoretical and practical insights provided by lecturers from academia and practice. Different project participants actively contribute to the program by adding their expertise and presenting their contributions to the project and the resulting insights. Activities include target group identification, curriculum programming and logistical planning, as well as lecturing for a course in Rotterdam. The program will be developed in such a way that it has the potential to be replicated in different locations and in time. A feasibility study will be made to evaluate whether the program can be continued on a stand-alone bases after the project life span to continue dissemination of the project's legacy.

Task 9.7 Citizen and stakeholder engagement at a local level (Lead: Lighthouse Cities Input: ICLEI) [M1-M60] Purpose: to engage with local citizens who will be directly impacted and in effect the key end users of the smart solutions being implemented in the Lighthouse Cities.

Subtask 9.7.1: Local communication strategies and local dissemination managers (D9.2)

The designated local dissemination manager for each Lighthouse City will provide a local dissemination plan, based on the template provided by ICLEI (as annex of D9.1), outlining the activities to be carried out at a local level. While the European level strategy has a broader policy-maker, industry and city practitioner focus, the primary target group would be citizens, industry and regionally close cities. The strategy will outline the main activities which will be completed by the Lighthouse Cities in the scope of the project including: digital media, the materials to be produced and the activities foreseen. Dissemination Managers in charge of writing the strategy will also participate in the strategic meetings described under Task 9.1.

Subtask 9.7.2: Communication materials and information stands

Selected materials produced within the project will be translated (see Task 9.3) e.g. banner, informational poster and brochures to the local languages and adapted to local conditions in order to better reach the local public. Information stands, preferably permanent for the duration of the project, will be available in a public space (ideally close to the work site) giving an overview of RUGGEDISED and the impact it will have on the area.

Subtask 9.7.3: Local websites, videos and social media

Each Lighthouse city will develop a web page about the project on their city website this will be written in the local language and will include: an overview of the project, an overview of the solutions to be implemented in the local vicinity in terms of the three action areas and include videos (task) available in the local language. This web page will remain relatively static but will include links to the blogs, to be translated into the local language and be linked to the overall project website.

Each Dissemination manager will set up a Twitter account for the Lighthouse City using the RUGGEDISED logo and keep this updated with project developments, referencing local industry partners (linking in with Task 9.4). The Dissemination Manager will be responsible for providing photo documentation together with the work lead manager which will feed into the tweets, the Flickr channel and blog posts.

Subtask 9.7.3: Volunteer-driven activities (perhaps more appropriately termed events)

Lighthouse Cities are expected to work locally with citizens and volunteers to develop appropriate activities related to smart city objectives e.g. to train elderly in the use of computers and social media, hackathons and/or community reporter initiatives.

Task 9.8 Data management (Lead: ICLEI, Input: Academic partners) [M1-M60]

Purpose: facilitate and potentiate exploitation opportunities of data produced in the scope of the project.

RUGGEDISED will capitalise on the development of a well-defined Data Management Plan (DMP). A data management plan will be developed in the first six months of the project (D9.21), as described previously in section 2.2.5 It will describe all of the data that will be created in the project and how this data will be handled during the project and after its completion. All data and methodologies will be openly accessible at the completion of the project, as far as possible via the main project website.

The Data Management Plan (DMP) will include:

- Data Types, Formats, Standards and Capture Methods
- Ethics and Intellectual Property
- Access, Data Sharing and Reuse
- Resourcing
- Deposit and Long-Term Preservation

- Short-Term Storage and Data Management

DMP will comply with the EC DMP template14 and will specify how the generated data will be easily discovered, preferably via DOI, and accessed, ensuring open access by adopting the adequate licensing scheme (e.g. Creative Commons License). Moreover, DMP will describe quality evaluating tools/procedures, which will prove the data intelligibility. DMP will also define the type of accompanying information in the form of metadata or short description to allow potential users to gain awareness on the data concepts and evaluate their suitability for future use.

As the Ethics commission has raised points related to data, which in turn has lead to the Ethics requirements related to (personal) data collection, storage, protection, retention and destruction, the DMP will synchronise with the relevant deliverable (D.11.1 - POPD - Requirement No. 1) of the coordinator.

Task 9.9 Monitoring & evaluation (Lead: ICLEI Input: All partners) [M1-M60]

Purpose: to highlight the areas of a strategy that are working well and areas which are under-performing, to help refine the communication actions on a continuous basis.

Subtask 9.9.1: Tracking tool

ICLEI will manage the evaluation and monitoring of communications and dissemination. ICLEI will provide partners with a tracking tool specially developed for the project to help them keep a record of dissemination activities. Partners are responsible for completing this form as fully as possible and returning to ICLEI to feed into the mid-term internal review of the communications strategy (Subtask9.2.1). RUGGEDISED's midterm strategy will evaluate whether communication efforts of the consortium are on track, not only assessing its own success (i.e. delivery of good quality products and services) but also by assessing tangible impacts vis-à-vis the broader stated goals and objectives. For this reason, efforts will be taken in order to track existing communication/dissemination activities, and also to develop an evaluation framework for these.

Subtask 9.9.2: Collecting and analysing

ICLEI is responsible for collecting dissemination activities, and evaluating these statistics to see if KPIs for communication and dissemination are being reached. ICLEI will keep track of the impact of content uploaded to the social media channels to understand what topics stimulate discussion and what content encourages users to follow RUGGEDISED.

ICLEI will at conduct analysis of the impact of content uploaded in order to draw conclusions for future RUGGEDISED coordination and support actions.

Subtask 9.9.3: Mini reports

ICLEI will be prepare mini reports, presented in the form of a PPT for project meetings to give partners an update on communication and dissemination activities and the relative impact as well as the strategy and tactics going forward highlighting where partners involvement is key.

Subtask 9.9.4: Communication and dissemination workshops:

ICLEI will be lead on workshops (held in conjunction with the project meetings) on communication and dissemination which will be aimed at Dissemination Managers or Lighthouse and Follower city representatives. The meetings will be an opportunity to give brief updates on recent RUGGEDISED communication activities happening within the cities and propose content for the e-update, and explore synergies for common dissemination activities across cities/projects/ events.

Participation per Partner

Partner number and short name	WP9 effort
1 - ROT	13.00
2 - UME	12.80
3 - GCC	12.80
4 - SP	1.80
5 - ISINNOVA	1.80
6 - AIT	1.80
7 - TNO	1.80
8 - ICLEI	64.00
9 - EUR	6.80
10 - UU	1.30
11 - US	1.30
12 - UB	1.30
13 - Brno	3.40
14 - Parma	3.40
15 - Gdansk	3.40
16 - BN	0.30
17 - RET	0.30
18 - ENE	0.30
19 - KPN	0.30
20 - AHAB	0.30
21 - VCC	0.30
22 - UEAB	0.30
23 - UPAB	0.30
24 - TS	0.30
25 - SPPS	0.30
26 - TCB	0.30
27 - SIE	0.30
28 - PIC	0.30
29 - UNR	0.30

Partner number and short name	WP9 effort
30 - INF	0.30
31 - FI	0.30
32 - WG	0.30
33 - GIWK	0.30
34 - SI	0.30
Total	136.40

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D9.1	Communications & Dissemination Strategy	8 - ICLEI	Other	Public	3
D9.2	Local communication strategy	8 - ICLEI	Other	Public	3
D9.3	Corporate design (logos, templates & branding guide)	8 - ICLEI	Other	Public	5
D9.4	Project website	8 - ICLEI	Other	Public	6
D9.5	E-update	8 - ICLEI	Other	Public	8
D9.6	Promotional brochure	8 - ICLEI	Other	Public	8
D9.7	European workshop 1/5	8 - ICLEI	Other	Public	10
D9.8	Study visit in Lighthouse City, including one national/regional showcase event per Lighthouse City 1/3	8 - ICLEI	Other	Public	16
D9.9	European workshop 2/5	8 - ICLEI	Other	Public	22
D9.10	Article in media 1/3	8 - ICLEI	Other	Public	24
D9.11	Smart Cities Technical Factsheets	8 - ICLEI	Other	Public	24
D9.12	Study visit in Lighthouse City, including one national/regional showcase event per Lighthouse City 2/3	8 - ICLEI	Other	Public	30
D9.13	European workshop 3/5	8 - ICLEI	Other	Public	34
D9.14	Article in media 2/3	8 - ICLEI	Other	Public	36
D9.15	Smart Cities Thematic Factsheets	8 - ICLEI	Other	Public	42
D9.16	Study visit in Lighthouse City, including one	8 - ICLEI	Other	Public	44

List of deliverables					
Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
	national/regional showcase event per Lighthouse City 3/3				
D9.17	European workshop 4/5	8 - ICLEI	Other	Public	46
D9.18	Article in media 3/3	8 - ICLEI	Other	Public	48
D9.19	European workshop 5/5	8 - ICLEI	Other	Public	58
D9.20	Project Results Brochure	8 - ICLEI	Other	Public	58
D9.21	Data Management Plan	8 - ICLEI	ORDP: Open Research Data Pilot	Public	6
		Description of delive	rables		

D9.1 : Communications & Dissemination Strategy [3]

The strategy will outline a systematic approach to reaching out and communicating to its target audience actions it wants them to take (i.e. uptake of the smart solutions and transitioning towards smart city development) through tailored activities and appropriate communications mix.

D9.2 : Local communication strategy [3]

The local dissemination plan will define the activities to be carried out at a local level focus, the primary target group would be citizens, industry and regionally close cities. The strategy will outline the main activities which will be completed by the Lighthouse Cities in the scope of the project including: digital media, the materials to be produced and the activities foreseen.

D9.3 : Corporate design (logos, templates & branding guide) [5]

An attractive, modern and authoritative visual identity reflecting the ambition of the RUGGEDISED project and the messages it wants to send will be created as part of this task and applied across all of the project's communications platforms and products.

D9.4 : Project website [6]

A project website will designed, developed and maintained throughout the lifetime of the project to showcase the RUGGEDISED cities, the smart solutions and engagement opportunities (e.g. registration for study visits, product demos) for other cities, industry and other stakeholders.

D9.5 : E-update [8]

The e-updates will be disseminated electronically every four months. All issues will be accessible through an updated archive on the project website. Blog posts from the Lighthouse cities will form the key content and smart city events highlighting those that the project will be attending.

D9.6 : Promotional brochure [8]

A project brochure, giving an overview of the RUGGEDISED project, will be developed to ensure a good level of visibility of RUGGEDISED at events and communicate the key elements of the project at a glance.

D9.7 : European workshop 1/5 [10]

The first in a series of workshops designed to provide an opportunity to showcase the experiences of the Lighthouse and Follower cities together with reactions from other stakeholders e.g. industry partners and representatives from other Smart City Projects. With a strong focus on interaction and peer-to- peer exchange, efforts will be made to find innovative ways of documenting these workshops to maximise dissemination. These will be held within the scope or back-to-back with European/International 'Smart city' events.

D9.8 : Study visit in Lighthouse City, including one national/regional showcase event per Lighthouse City 1/3 [16]

Study visits in the Lighthouse cities will be prganised in the scope of the RUGGEDISED project. These would be open principally to the City Interest Group, but other cities may also register their interest via an online form on the project website.

D9.9 : European workshop 2/5 [22]

The second in a series of workshops designed to provide an opportunity to showcase the experiences of the Lighthouse and Follower cities together with reactions from other stakeholders e.g. industry partners and representatives from other Smart City Projects. With a strong focus on interaction and peer-to- peer exchange, efforts will be made to find innovative ways of documenting these workshops to maximise dissemination. These will be held within the scope or back-to-back with European/International 'Smart city' events.

D9.10 : Article in media 1/3 [24]

RUGGEDISED will also publish articles on (intermediate and final) results in specialist city, transport, energy and building infrastructure magazines. Published articles will also be disseminated via the RUGGEDISED digital media channels and included on a regular basis in the well-established and widespread communication channels of the respective network partners involved in RUGGEDISED.

D9.11 : Smart Cities Technical Factsheets [24]

Factsheets provide a concise, yet informative tool to share information. For those wishing to find out more technical and detailed information about the smart solutions a series of factsheets will be produced by site managers in WP2-4 together with industry partners. These are designed to share in detail the benefits of the 12 solutions in an easily accessible way. In terms of developing and disseminating them, the following steps are involved for ICLEI: • A design template for the factsheets will be produced as part of Task 9.3 to ensure that these are presented in a clear and consistent way. • The content guide is to ensure that communications texts, material, and publications meet high standards while also being accessible to non-native English speakers. • A reduced template and content guide will be delivered by ICLEI to the site leaders, who are responsible for collating and returning the completed versions. • The text will be edited and proofread by ICLEI's professional editorial staff. • The text will be embedded by ICLEI into the templates and then uploaded onto the project website for dissemination. • Factsheets will then be promoted through website cross-linking and will be included in the e-update as well as through other project communication channels.

D9.12 : Study visit in Lighthouse City, including one national/regional showcase event per Lighthouse City 2/3 [30] Study visits in the Lighthouse cities will be prganised in the scope of the RUGGEDISED project. These would be open principally to the City Interest Group, but other cities may also register their interest via an online form on the project website.

D9.13 : European workshop 3/5 [34]

The third in a series of workshops designed to provide an opportunity to showcase the experiences of the Lighthouse and Follower cities together with reactions from other stakeholders e.g. industry partners and representatives from other Smart City Projects. With a strong focus on interaction and peer-to- peer exchange, efforts will be made to find innovative ways of documenting these workshops to maximise dissemination. These will be held within the scope or back-to-back with European/International 'Smart city' events.

D9.14 : Article in media 2/3 [36]

Each partner shall deliver a minimum of 3 short articles published via external media outlets. The project partners' press and media contacts will be used to strategically place the outcomes of the project on local, regional, national and European levels.

D9.15 : Smart Cities Thematic Factsheets [42]

Factsheets will be produced focusing on particular aspects of the smart city approach and how these can help tackle common challenges faced by cities and local regions across Europe.

D9.16 : Study visit in Lighthouse City, including one national/regional showcase event per Lighthouse City 3/3 [44] Study visits in the Lighthouse cities will be prganised in the scope of the RUGGEDISED project. These would be open principally to the City Interest Group, but other cities may also register their interest via an online form on the project website.

D9.17 : European workshop 4/5 [46]

The fourth in a series of workshops designed to provide an opportunity to showcase the experiences of the Lighthouse and Follower cities together with reactions from other stakeholders e.g. industry partners and representatives from

other Smart City Projects. With a strong focus on interaction and peer-to- peer exchange, efforts will be made to find innovative ways of documenting these workshops to maximise dissemination. These will be held within the scope or back-to-back with European/International 'Smart city' events.

D9.18 : Article in media 3/3 [48]

RUGGEDISED will also publish articles on (intermediate and final) results in specialist city, transport, energy and building infrastructure magazines. Published articles will also be disseminated via the RUGGEDISED digital media channels and included on a regular basis in the well-established and widespread communication channels of the respective network partners involved in RUGGEDISED.

D9.19 : European workshop 5/5 [58]

The fifth in a series of workshops designed to provide an opportunity to showcase the experiences of the Lighthouse and Follower cities together with reactions from other stakeholders e.g. industry partners and representatives from other Smart City Projects. With a strong focus on interaction and peer-to- peer exchange, efforts will be made to find innovative ways of documenting these workshops to maximise dissemination. These will be held within the scope or back-to-back with European/International 'Smart city' events.

D9.20 : Project Results Brochure [58]

A brochure will be produced to present key results from the project.

D9.21 : Data Management Plan [6]

RUGGEDISED will capitalise on the development of a well-defined Data Management Plan (DMP). A data management plan will be developed in the first six months of the project (D9.21), as described previously in section 2.2.5 It will describe all of the data that will be created in the project and how this data will be handled during the project and after its completion. All data and methodologies will be openly accessible at the completion of the project, as far as possible via the main project website. The Data Management Plan (DMP) will include: - Data Types, Formats, Standards and Capture Methods - Ethics and Intellectual Property - Access, Data Sharing and Reuse - Resourcing - Deposit and Long-Term Preservation - Short-Term Storage and Data Management DMP will comply with the EC DMP template14 and will specify how the generated data will be easily discovered, preferably via DOI, and accessed, ensuring open access by adopting the adequate licensing scheme (e.g. Creative Commons License). Moreover, DMP will describe quality evaluating tools/procedures, which will prove the data intelligibility. DMP will also define the type of accompanying information in the form of metadata or short description to allow potential users to gain awareness on the data concepts and evaluate their suitability for future use. As the Ethics commission has raised points related to (personal) data collection, storage, protection, retention and destruction, which in turn has lead to the Ethics requirements attributed to Ruggedised, the DMP will synchronise with the relevant deliverable of the coordinator.

Schedule of relevant Milestones

Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
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Work package number ⁹	WP10	Lead beneficiary ¹⁰	1 - ROT
Work package title	Project Manag	gement	
Start month	1	End month	60

Objectives

1. Support efficient day-to-day project operation, organising project functions and meetings.

2. Monitor and supervise the project development in order to fulfil the work programme activities, objectives and schedules, technical coordination.

3. Support contractual, financial and administrative aspects of the RUGGEDISED-project.

4. Ensure effective communication between the consortium partners and the EU Commission project officer

Description of work and role of partners

WP10 - Project Management [Months: 1-60]

ROT, UME, GCC, AIT, UNR

This WP includes setting up the administrative routines and carrying out activities to ensure that all partners fully understand their role and are committed to the project. It implements routines for communication, document exchange, technical and financial progress reporting, to assure that resources allocated to meet the project objectives are properly utilised. All management work will be carried out within this WP, except for the specific management which is integrated into each WP, including the lighthouse WPs. And, of course, all these WP-leaders will also organise the management of their work packages firmly and transparent.

The project coordination is based on a philosophy of management by objectives, in which delegation of responsibility, communication, trust and realistic objectives are the key to the management structure. Partners, within the local ecosystem as well as in the whole consortium, are requested to provide frequent feedback on their progress and any potential problems. The focus is on communication, cooperation and RUGGEDISED responsibility, as opposed to scrutiny and control. The overall goal is to identify problems early and undermine any negative (administrative, financial, technical, involvement and commitment and so on) effects efficiently and effectively, before unwanted consequences become unavoidable. The Grant and Consortium Agreement both will be based on this philosophy.

This WP is divided into 5 tasks. The city of Rotterdam as the WP-leader will install a powerful Project Management Group (PMG) to ensure all of these five tasks are fulfilled. As mentioned, all other WP-leaders will organise the management of their Work Packages properly. Based on the same principles and management philosophy.

Task 10.1 Administrative Management (Lead: ROT; Partners: UNR) (M1-60)

This task starts with the setup of a Smart City Programme Management Group (PMG) comprising the City of Rotterdam (=the coordinator), as well as the management support partner Uniresearch and AIT (innovation manager). This PMG will function as the heart of the project and is responsible for the total management of the programme on a day to day basis. The PMG is organizing all the tasks mentioned in this work package. It will guide the decision-making, partnership cooperation/coordination and sharing of responsibilities. Furthermore it:

- ensures efficient controlling and reporting, including the establishment of efficient communication routines and preparation of progress reports. This contains also to take care of the day to day contractual, administrative management; - organises and prepares Steering Group (SG) meetings and General Assembly (GA) meetings, as well as the follow up of these meetings including drafting of minutes. Work Package leaders as well as the six leaders of the City Governances/ City Leaders will participate in the Steering Group Meetings. The meeting of the General Assembly will be joined by all consortium partners.

An Advisory Board consisting of smart city experts including Wolf Prix (Coop Himmelb(l)au), G. Colclouch (EIP-Smart Cities and Communities), Prof. A. Van Timmeren (TU Delft) and Prof. T. Olofson (Umea University) is established. The aim of the board is to engage ambassadors and spokespersons for the project, to raise RUGGEDISED' visibility and to build networks both within the project but more importantly to external audiences.

Task 10.2 Contractual, financial and organisational management (Lead: ROT; Partners: UNR, AIT) [M1-60] The activities in this task are:

- Financial supervision and financial reporting, including the day to day financial management;

- Maintaining the Grant Agreement and the Consortium Agreement including the preparation of Amendments, if required;

- Developing well-proven financial routines/templates effecting financial reporting to establish and maintain firm control of project finances and resources (progress, budget, costs), including the introduction of an early warning system based on a risk assessment and a risk management plan.

- Supporting and following the preparation of cost statements of partners, including the compilation and submission of financial reports to the Commission, distributing funds received, keeping records of financial accounts.

UNR will be responsible for handling the overall deliverable process chain and first check on form and completeness. Furthermore, a peer review responsibilities matrix will be compiled with two peer reviewers for each Deliverable. All RUGGEDISED consortium members will participate in the peer review of deliverables. UNR will prepare the peer review matrix and make sure that all partners abide to it.

Task 10.3 Innovation Management, including risk management and quality assurance (Lead: AIT Partners: GCC, UME, ROT, UNR) [M1-60]

This task aims at supporting the smooth developing of innovations and smart solutions, their deployment, upscaling and replication as outlined in the RUGGEDISED Deployment and Replication Concept.

This task will focus on the project specific innovations by overseeing the reaching of targets and achievements in terms of time and quality and with respect to their innovation capacities. The innovation manager (AIT) will support the project coordinator for the innovation aspects (scientific and technological) of the project.

A Risk Management Plan will be developed and proposed by the Innovation Manager to the PMG. It will be available in the first four months of the project to be approved by the General Assembly. The plan will identify risks and contingency plans, and risk management protocols. It will be monitored by the Steering Group, and the plan will be updated accordingly. Not only afterwards the delivery of project results (deliverables) but also beforehand the possible risks will be identified and assessed regarding the threat they pose. A plan for reducing risk levels including precautionary and mitigation measures as well as fall back solutions will be established by the SG. The SG will ensure that these strategies will be implemented. The Innovation manager is responsible for the risk management and smooth progress of the whole project while Work package Leaders have the corresponding responsibility at the work package level.

Furthermore, the task will elaborate and determine a Quality Assurance Plan including procedures for the flow of information, timing to meet the Deliverable deadlines, responsibilities and Deliverables acceptance criteria. Quality criteria and the review process for Deliverables will be outlined. AIT will prepare the Quality Assurance Plan and discuss this with the PMG and the Steering Group. It will continually be updated as a living document.

Task 10.4 Internal and external Communication Lead: ROT; Partners: UNR [M1-60]

Ensure effective communication among partners and be the single point of contact (SPOC) to the European Commission, connected to the Steering Group members, and coordinate the WP-leaders.

UNR brings in its expertise in multi-project management with an array of (online) project management tools. This will ensure effective communication among the partners and a focus on delivery. One of the tools is the set-up and maintenance of a web based tool for internal communication, documentation (archive), automating and streamlining the management routines, on-line manuals and procedures and monitoring of the progress in terms of deliverables, milestones, task completion and resource use.

Task 10.5 Periodic reports (Lead: ROT; Partners: UNR, GCC, UME) [M1-60]

Regarding the tasks in WP10 periodic reports are a main product of the PMG. The periodic and final required reports coming from the PMG are obligatory and are included in the periodic reporting systems of the European Commission. This task 1.5 is the result of the task 1.1 - 1.4. This to ensure the delivery of the needed reports on schedule. And to describe the progress in the Work Packages.

Participation per Partner			
Partner number and short name WP10 effort			
1 - ROT	40.00		
2 - UME	2.00		

Partner number and short name	WP10 effort
3 - GCC	2.00
6 - AIT	16.00
29 - UNR	48.00
Total	108.00

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D10.1	Quality assurance and Risk Management plan	6 - AIT	Report	Confidential, only for members of the consortium (including the Commission Services)	6

Description of deliverables

D10.1 : Quality assurance and Risk Management plan [6]

An Initial Quality and Risk Management plan will be created, including procedures and used throughout the project lifetime to have an early reminder / warning system and to be able to implement the mitigation plan on time, at M6 and afterwards being a living document.

Schedule of relevant Milestones

Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
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Work package number ⁹	WP11	Lead beneficiary ¹⁰	1 - ROT
Work package title	Ethics requirements		
Start month	1	End month	60

Objectives

The objective is to ensure compliance with the 'ethics requirements' set out in this work package.

Description of work and role of partners

WP11 - Ethics requirements [Months: 1-60]

ROT

This work package sets out the 'ethics requirements' that the project must comply with.

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D11.1	POPD - Requirement No. 1	1 - ROT	Ethics	Confidential, only for members of the consortium (including the Commission Services)	6
D11.2	EPQ - Requirement No. 2	1 - ROT	Ethics	Confidential, only for members of the consortium (including the Commission Services)	1

Description of deliverables

The 'ethics requirements' that the project must comply with are included as deliverables in this work package.

D11.1 : POPD - Requirement No. 1 [6]

Copies of opinion or confirmation by the competent Institutional Data Protection Officer and/or authorization or notification by the National Data Protection Authority must be submitted (which ever applies according to the Data Protection Directive (EC Directive 95/46, currently under revision, and the national law). Detailed information must be provided on the procedures that will be implemented for data collection, storage, protection, retention and destruction and confirmation that they comply with national and EU legislation. Detailed information on the informed consent procedures that will be implemented in regard to the collection, storage and protection of personal data must be submitted on request.

D11.2 : EPQ - Requirement No. 2 [1]

The applicant must ensure that appropriate health and safety procedures conforming to relevant local/national guidelines/legislation are followed for staff involved in this project.

Schedule of relevant Milestones				
Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification

Milestone number ¹⁸	Milestone title	WP number ⁹	Lead beneficiary	Due Date (in months) ¹⁷	Means of verification
MS1	Inception phase completed/innovation framework ready		1 - ROT	6	The means of verification of this milestone will be that D1.1 is drafted and agreed on at General Assembly
MS2	City Interest Group set up		8 - ICLEI	6	The means for verification for this milestone is that the City interest group is formalised and cities confirmed, related to task 9.5
MS3	City governing groups formed in all cities		5 - ISINNOVA	12	The means to verify this milestone is when the city governing groups are formalised and agreed, related to task 7.2 and activities started in WP2-4 in the first task
MS4	Urban Innovation Platforms set up		4 - SP	19	This milestone can be verified after completion of the first phase of task 6.1 (M9-18)
MS5	Assessment of long term potential of smart solutions concluded		4 - SP	30	This milestone can be verified with D6.5 drafted and concluded
MS6	Smart solutions implemented at the three Lighthouse cities		1 - ROT	36	Submission of first Implementation Reports by ROT-UME-GCC (D2.6, D3.4, D4.6) will show if this milestone has been reached or not.
MS7	Study Tours completed		5 - ISINNOVA	43	The milestone can be verified by the minutes of the meetings provided and agreed, related to task 7.1
MS8	Validation of solutions completed		6 - AIT	48	A means of verification is Interim D5.5 discussed with and agreed by the cities
MS9	Smart City Business Model Approach set up and running		4 - SP	48	Means of verification is D6.6 ready and approved by cities
MS10	Training workshops accomplished		5 - ISINNOVA	54	Means of verfication are minutes of the meetings, related to D7.1, D7.3, D7.6, D7.8, D7.13, D7.15.
MS11	Exploitation activities completed		8 - ICLEI	58	The means of verficiation is the submission of D9.20 on project results brochure

1.3.4. WT4 List of milestones

Milestone number ¹⁸	Milestone title	WP number ⁹	Lead beneficiary	Due Date (in months) ¹⁷	Means of verification
MS12	Evaluation completed		6 - AIT	60	The means of verification is the submission of final version D5.5.
MS13	Replication in follower cities successful		5 - ISINNOVA	60	The means of verification of this milestone is submission D7.17 and D7.18

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
1	Change of personnel in the consortium		A system with open files accessible to all project partners make it possible for new personnel to continue
2	Change of personnel at local level		Local team consist of several persons, knowledgeable of the project
3	Since WPs are complementary and strongly interact, the delay in the deliverables flow of a WP could affect the time schedule of the other WPs and delay the entire project.		Accurate and fully agreed definition of role and duties of each partner. Thematic and operational responsibilities have been assigned in a very explicit manner at the outset, matching the core competencies of each partner, and leaving limited room to ambiguities in the interpretation of "who does what".
4	A deliverable not produced by the due date or with a satisfactory quality could delay i) the linked activities and/or ii) the approval of the periodic activity reports.		Continuous monitoring of project advancement and strict enforcement of deadlines to ensure timely intermediate project results deliveries will be carried out by the WP Leaders. All project reports will be subject to internal peer review before the submission to the EC. Quality review will be assigned to participants that have not been involved in the drafting of the deliverable. WPL will be responsible for any redrafting, adjustment, clarification etc. that may arise from the quality review process.
5	Delays by one partner causes delayed payments		Coordinator will not wait longer than accepted by Project Management Group. All partners have high liquidity
6	The smart solutions of the project depend on investments in smart assets in order to lower operational expenditure and risks of shortcomings.		One of the key features of the proposal is the careful selection of each individual smart solution according to the pre-existing financing environment.
7	Misunderstandings, resulting from poor communication, can easily cause delay in the work plan and/or reduce the clarity of project functioning.		High quality relationships among the partners, which has been extensively tested during the project design and the proposal preparation phase. The PC will be responsible of guaranteeing a smooth communication among partners and assure the timely implementation of the Work plan. Any internal conflict within a WP will be resolved by consensus under the guidance of its WP L or if it cannot be solved the issue will be reported to the SG to identify solutions acceptable to all.
8	Different cities use different monitoring methodologies and metrics. Incomparable datasets produced Difficulty in generating relevant monitoring data for projects		A common monitoring protocol will be agreed upon. This will ensure that common and recognised principles will be applied across the demonstration projects to ensure comparability of performance data

1.3.5. WT5 Critical Implementation risks and mitigation actions

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
	and underestimation of time required to acquire data		
9	Too much data to process		Selection of cases and KPIs carefully
10	Insufficient involvement of stakeholders with effect on demonstration actions		Cover widely the potential options for stakeholder involvement and monitor carefully motivation levels to avoid discouragement and/or negative behaviours
11	Demonstration fail or are considerable delayed due to local conditions, lack of partners, investment or legal regulation.		Good and stable RUGGEDISED consortium with close cooperation between public, commercial and academic sector
12	Scaling roadmaps may be difficult to establish due to existing local, regional and national vision and strategy documents.		Initial discussions early on in the project in order to understand the local policy context in each LHC. The roadmaps must be flexible in order to fit in and add value to already existing strategy documents.
13	Measures prove not to achieve the energy savings goals and replication potential as set up by the project and call text		Carefully selected measures, industry partners with capability to serve Europe with measures and cities willing to demonstrate and further replicate the measures
14	The implementation of smart solutions in the lighthouse cities involve complex actor structures and implementation processes that may be delayed due to unexpected difficulties in the installation/construction of smart solutions		The smart solutions suggested in this proposal are well-planned and prepared, the proposal stage has been used to make sure that smart solutions are ready for implementation early on in the project in order to always ensure enough time for monitoring. Minor delays in the implementation of single smart solutions are not going to affect the overall success of the project and will be analysed as lessons learned for further scaling up and replication
15	Different procedures and metrics exist regarding data collection and measurement in the energy, ICT, transport and infrastructure sectors		Monitoring and evaluation starts with a rigorous definition of monitoring and metrics guidelines co-developed by the work package leaders and the evaluation experts of each lighthouse and follower city
16	LHCs experience difficulties collecting the required data and the overall progress of the WP is affected		Continuous monitoring of progress and strict enforcement of deadlines to ensure timely delivery of results will be carried out by the WP Leader
17	Smart city solution are often hampered by inconsistent standards, even within the same city, and regulations (especially across countries)		One of the primary objectives of the SCC Call is to contribute to harmonising standards and contribute to regulations at the EU level. RUGGEDISED maintains stream of activities expressly dedicate to building analytical frameworks that should allow lighthouse and follower cities to best compare practices and work towards mutually reinforcing and harmonising approaches.

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
18	The implementation of smart solutions and analysis of their transferability and scalability potential require continues commitment from all participating cities and their local partners to guarantee success of implementation and access to knowledge and data to identify upscaling potentials and evaluate solutions.		All project partners are highly committed to the project activities and good working relationships with city officials have already been established in the proposal phase. The support offered by the project to the cities provides them with the necessary resources to spend additional time on mutual learning etc. An efficient management structure will be put in place that will align all activities as smoothly as possible
19	Follower cities do not replicate desired smart solutions		Involve Follower cities from the start of the deployment of measures and communicate advantages and disadvantages in a transparent manner
20	The smart solutions included in RUGGEDISED cover a wide range of applications in the energy, building and transport sector, included hardware and software, as well as different business and management options and open data solutions		Certain overlaps have already been identified during the proposal stage and the transferability analysis will identify the central aspects of each smart solution. In addition, there is great interest to not only transfer technical solutions, but also managerial and procedural solutions (including public participation and data management) for smart cities. These lessons regarding enablers will be identified and discussed between cities to enable transfer.
21	No exploitable results identified		A set of exploitation workshops along the complete duration of the project will assure that exploitable results such as products, services or methodologies will be identified for further investigation
22	Selection of the wrong target groups failure of addressing the selected target groups failure of setting target group tailored messages		Target groups have been defined during the proposal phase. During the implementation phase the Communication Secretariat will constantly assure the right selection of target groups and will adjust if necessary. The yearly updated detailed Dissemination and Communication strategy as well as the reports on dissemination and communication activities will ensure the optimal output and outcome
Associated with document Ref. Ares(2016)5910251 - 13/10/2016

1.3.6. WT6 Summary of project effort in person-months

Total Person/Months per Participant	137	103.80	121.80	66.30	61.80	113.30	60.80	83	52.80	35.30	44.80	26.30	52.40	52.40	42.40	32.30	35.80	35.80	34.80	25.80	30.80	37.80	16.80
WP11																							
WP10	40	5	5	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64W	13	12.80	12.80	1.80	1.80	1.80	1.80	64	6.80	1.30	1.30	1.30	3.40	3.40	3.40	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
WP8	5	5	5	0.50	5	0	0	5	0	0	0.50	0	0	0	0	0.50	0	0	0	0	0	0	0
WP7	0.50	0.50	0.50	2	43	14	2	2	0	0	0	25	47	47	37	0	0	0	0	0	0	0	0
WP6	13.50	13.50	13.50	31	2	10	10	0	8	0	10	0	0	0	0	0	0	2	0	0	0	2	0
WP5	3	ю	ю	10	2	61.50	16	0	0	9	8	0	2	2	2	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
WP4	0	0	78	0	0	0	0	5	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0
WP3	0	60	0	10	0	0	0	e	0	28	0	0	0	0	0	0	0	0	0	25	30	35	16
WP2	49	0	0	0	0	0	6	ю	34	0	0	0	0	0	0	31	35	33	34	0	0	0	0
WP1	13	7	7	11	8	10	25	4	4	0	13	0	0	0	0	0	0	0	0	0	0	0	0
	1 - ROT	2 - UME	3 - GCC	4 - SP	5 - ISINNOVA	6 - AIT	7 - TNO	8 - ICLEI	9 - EUR	10 - UU	11 - US	12 - UB	13 - Brno	14 - Parma	15 - Gdansk	16 - BN	17 - RET	18 - ENE	19 - KPN	20 - AHAB	21 - VCC	22 - UEAB	23 - UPAB

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	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	6dM	WP10	WP11	Total Person/Months per Participant
24 - TS	0	0	0	11	0.50	0	0	0	0.30	0		11.80
25 - SPPS	0	0	0	16	0.50	2	0	0	0.30	0		18.80
26 - TCB	0	0	0	6.50	0.50	0	0	0	0.30	0		7.30
27 - SIE	0	0	0	34	0.50	0	0	0	0.30	0		34.80
28 - PIC	0	0	0	0	0	0	14	0	0.30	0		14.30
29 - UNR	0	0	0	0	0	0	0	4.50	0.30	48		52.80
30 - INF	0	0	0	0	0.50	0	18	0	0.30	0		18.80
31 - FI	0	30	0	0	0	0	0	0	0.30	0		30.30
32 - WG	0	0	0	4	0	0	0	0	0.30	0		4.30
33 - GIWK	0	0	0	0	0	0	13	0	0.30	0		13.30
34 - SI	0	0	0	0	0.50	7	0	0	0.30	0		7.80
Total Person/Months	102	255	207	163.50	125.50	124.50	265.50	31	136.40	108		1518.40

Review number ¹⁹	Tentative timing	Planned venue of review	Comments, if any
RV1	20	To be discussed	The reviews should take place about 2 months after the end of each reporting periods
RV2	32	It should take place at a lighthouse city in order to visit demonstrators	The reviews should take place about 2 months after the end of each reporting periods
RV3	44	It should take place at a lighthouse city in order to visit demonstrators	The reviews should take place about 2 months after the end of each reporting periods
RV4	60	It should take place at a lighthouse city in order to visit demonstrators	Review month to be decided towards the end of the project

1. Project number

The project number has been assigned by the Commission as the unique identifier for your project. It cannot be changed. The project number **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

2. Project acronym

Use the project acronym as given in the submitted proposal. It can generally not be changed. The same acronym **should** appear on each page of the grant agreement preparation documents (part A and part B) to prevent errors during its handling.

3. Project title

Use the title (preferably no longer than 200 characters) as indicated in the submitted proposal. Minor corrections are possible if agreed during the preparation of the grant agreement.

4. Starting date

Unless a specific (fixed) starting date is duly justified and agreed upon during the preparation of the Grant Agreement, the project will start on the first day of the month following the entry into force of the Grant Agreement (NB : entry into force = signature by the Commission). Please note that if a fixed starting date is used, you will be required to provide a written justification.

5. Duration

Insert the duration of the project in full months.

6. Call (part) identifier

The Call (part) identifier is the reference number given in the call or part of the call you were addressing, as indicated in the publication of the call in the Official Journal of the European Union. You have to use the identifier given by the Commission in the letter inviting to prepare the grant agreement.

7. Abstract

8. Project Entry Month

The month at which the participant joined the consortium, month 1 marking the start date of the project, and all other start dates being relative to this start date.

9. Work Package number

Work package number: WP1, WP2, WP3, ..., WPn

10. Lead beneficiary

This must be one of the beneficiaries in the grant (not a third party) - Number of the beneficiary leading the work in this work package

11. Person-months per work package

The total number of person-months allocated to each work package.

12. Start month

Relative start date for the work in the specific work packages, month 1 marking the start date of the project, and all other start dates being relative to this start date.

13. End month

Relative end date, month 1 marking the start date of the project, and all end dates being relative to this start date.

14. Deliverable number

Deliverable numbers: D1 - Dn

15. Type

Please indicate the type of the deliverable using one of the following codes:

RDocument, reportDEMDemonstrator, pilot, prototypeDECWebsites, patent fillings, videos, etc.OTHERETHICSEthics requirement

16. Dissemination level

Please indicate the dissemination level using one of the following codes:

PU Public

CO Confidential, only for members of the consortium (including the Commission Services)

EU-RES Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)

EU-CON Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)

EU-SEC Classified Information: SECRET UE (Commission Decision 2005/444/EC)

17. Delivery date for Deliverable

Month in which the deliverables will be available, month 1 marking the start date of the project, and all delivery dates being relative to this start date.

18. Milestone number

Milestone number:MS1, MS2, ..., MSn

19. Review number

Review number: RV1, RV2, ..., RVn

20. Installation Number

Number progressively the installations of a same infrastructure. An installation is a part of an infrastructure that could be used independently from the rest.

21. Installation country

Code of the country where the installation is located or IO if the access provider (the beneficiary or linked third party) is an international organization, an ERIC or a similar legal entity.

22. Type of access

- VA if virtual access,
- TA-uc if trans-national access with access costs declared on the basis of unit cost,
- TA-ac if trans-national access with access costs declared as actual costs, and
- TA-cb if trans-national access with access costs declared as a combination of actual costs and costs on the basis of unit cost.

23. Access costs

Cost of the access provided under the project. For virtual access fill only the second column. For trans-national access fill one of the two columns or both according to the way access costs are declared. Trans-national access costs on the basis of unit cost will result from the unit cost by the quantity of access to be provided.

Technical Annex Part B

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Change log

No	Item	Date	Cha	anged	Page
1	Part B updated to match format	2016.07.20	-	Removed title page	All
			-	Removed list of partners	
			-	Updated header and footer	
			-	Removed WP tables (Table 3.1 a-c)	
			-	Removed List of Milestones (table 3.2a)	
			-	Removed list of Risks(table 4) (included in	
				the sygma) Added sections 4, 5, 6, 7, 8, 9	
2	Ethics comments addressed	2016.07.20	-	WP Ethics added in overall workplan	74
2	Other direct costs/ Section 3.4	2010.07.20	-	Added info to further justify the other direct	85-90
5		2010.07.20		costs for partner 3, 16, 19, 31	85-90
4	Third parties/subcontracting	2016.07.20	-	Removed the info about third parties from	189-194
				the partner description and moved relevant	
				info to section 4.2 – there will only be	
				subcontracting costs (for partners 14, 16, 20,	
				21, and 32), no linked third parties were	
-	E sudiana ant	2016 07 20		added	05.00
5	Equipment	2016.07.20	-	Added a row named "equipment" for	85-90
				partners 3, 10, 16, 17, 19 and 21 and	
				Section 3.4	
6	GCC deliverable D4 8 and smart	2016.07.20	-	Deliverable D4.8 mentioned the replacement	41
Ũ	solution G6/G8	2010.07.20		of 70.000 LED street lights by intelligent LED	Svgma
				columns – this is not realistic as the whole	-70
				city of Glasgow has around 70,000; the	
				project area will see roughly 300 lights	
				changed	
7	Section 4.2	2016.08.03	-	All subcontractors linked to specific tasks	189-194
8	Section 4.2 part no 32	2016.08.03	-	removed indirect costs from subcontracting	194
_				of part no 32	
9	Section 3.1: WP9	2016.08.03	-	included the statement: <i>Contribute, upon</i>	sygma
				invitation by the INEA, to common	
				information and dissemination activities	
				to increase the visibility and synergies	
				between H2020 supported actions, as	
				activity for the task 9.1 Communication	
				and Dissemination Secretariat	
10	Section 3.1: WP9	2016.08.17	-	New WP9 description based on the detailed	sygma
11		2016 00 02		explanation from WP9 lead.	05.00
11	Section 3.4	2016.08.03	-	Check on audit costs for partners exceeding	85-90
				325,000 funding, corrected for partners No.	
12	Partner SPEN replaced by SPPS	2016 08 22	-	Removed SPEN in entire document replaced	sygma
12		2010.08.22		it with SPPS_change in sigma has been	Sygina
				executed as well	
13	Partner ISIS new short name	2016.08.22	-	Partner ISIS is no longer called ISIS, but	sygma
	(ISINNOVA)			ISINNOVA; replaced in document and sygma	
14	Corrected short names of	2016.08.22	-	Short names of Swedish partners were in	33-36
	Swedish partners			Swedish (e.g. VLL instead of VCC); all were	
				corrected	
15	Corrected short names of	2016.08.22	-	Short name of Transport Scotland partner	41-43
	Scottish partner		ļ	was TSCO -> TS	
16	Platform architecture and	2016.08.22	-	A comment was added to the text on the	12
	technologies of the core			plattorm architecture and technologies of	

	data/service city platforms (ESR			the core data/service city platforms that will	
17	Investigate business structures and financing (ESR comment) and develop appropriate	2016.08.22	-	A statement was added on the dedication of all relevant partners to investigate business structures and financing and develop	52
18	impact of the deployment of a high number of electric vehicles on the grid (ESR comment)	2016.08.22	-	statement has been included in WP2-4 Task Increase the energy efficiency and Task Integration of E-Mobility	sygma
19	The integration of urban planning with the other pillars (ESR comment)	2016.08.22	-	statement included in WP2-4	sygma
20	Replication measures (ESR comment)	2016.08.23	-	statement was included in the paragraph on the main drivers for the project exploitation being lead first and foremost by the urban demand which shall be put (more) central and the cities' activities; statement was also added in Task 2.1/3.1/4.1 Coordination and management of the lighthouse activities	14, sygma
21	Subcontracting of partner 32: and 22	2016.08.24	-	partner 22: to indicate the task it is linked to and a proper explanation of what is to be subcontracted partner 32: removed cost breakdown	193-194

Foreword

On behalf of the cities of Rotterdam, Glasgow, Umeå, Gdansk, Brno and Parma we present to you our joint innovative proposal to the Smart Cities SCC1-2016 call:

connecting people, connecting communities, connecting environments Citizens, companies and institutes of research and technology from various countries and cultures across Europe will demonstrate their smart city environments. The aim is to redevelop our existing cities into future robust and strong cities. As mayors and/or leaders of cities we consider this proposal as an important first step.

In the next five years we will redevelop our existing neighbourhoods with proven technology in order to solve social, economic and environmental issues.

In five years' time there will be new cityscapes with new forms of local energy systems, lighting, water use and most importantly, neighbourhoods providing a safe, enjoyable and a creative living and working environment. Our economy as we know it will shift into a next economy with new models and structures. Thus the value of citizen life is getting an extra dimension. Our proposal will enable and accelerate this transition process. As connected cities we are committed to demonstrate how existing neighbourhoods are being redeveloped into low-energy districts, with sustainable urban transport, integrated energy systems and ICT infrastructures.

"Better well done than well said" is our guiding principle. By demonstrating the next integrated approach, urban authorities are setting future standards for excellence. In close collaboration with citizens, inventors, artists, developers, architects, research and knowledge institutes, companies and investors, we will develop future proof solutions and apply them to our cities. Rotterdam, Glasgow, Umeå, Gdansk, Brno and Parma will turn into living showcases for Europe.

Mayor of	Leader of	Mayor of	Mayor of	Mayor of	Mayor of
the City of	the City Council	the City of	the City of	the City of	the City of
Rotterdam	of Glasgow	Umeå	Brno	Parma	Gdansk
Ahmed	Frank	Hans	Petr Vokřál	Federico	Paweł
Aboutaleb	McAveety	Lindberg		Pizzarotti	Adamowicz

Associated with document Ref. Ares(2016)5910251 - 13/10/2016

Section 1 Excellence

1 Excellence

RUGGEDISED lighthouse Cities are forerunners in the transition towards a low carbon and resource efficient economy. As smart and sustainable cities they have chosen to become innovation leaders in providing smart solutions to significantly increase cities' overall energy and resource efficiency of building stock, energy systems, urban (e-)mobility and public space. Such actions should bring profound economic, social and environmental impacts for the cities, resulting in a better quality of life (including health and social cohesion), competitiveness, jobs and growth.

The lighthouse cities that will cooperate in the project are Rotterdam (the Netherlands), Glasgow (Scotland/United Kingdom) and Umeå (Sweden). The follower cities in RUGGEDISED are Brno (Czech Republic), Parma (Italy) and Gdansk (Poland). In addition to these, a Cities Interest Group consisting of amongst others Portland (USA) and Mumbai (India) have expressed their willingness to team up with the RUGGEDISED consortium.

The participating partners in RUGGEDISED have joined forces, based on the full understanding that the EU vision of a green digital economy is the cornerstone of an emerging third industrial revolution. As stated by Jeremy Rifkin, an Internet of Things infrastructure is being formed out of the convergence of the digitalized communication internet with both a digitalized renewable energy internet and a digitalized automated transportation and logistics internet. Digitalization of communication, energy and transportation together with the application of principles of circularity in the economy will greatly affect the workings of every economic sector, thus shaping the Cities of the future.

For RUGGEDISED cities and their partners, the task is two-fold. First and foremost, it is their task to invest, together with citizens and businesses in ensuring that buildings and whole districts will undergo a transition towards the effective and efficient use of renewable energy technologies in thermal and electricity grids, supported by smart ICT solutions, to the benefit of the citizens and to tackle climate change issues.

Secondly, it is the task of RUGGEDISED cities and their partners to ensure that new possibilities to improve the quality of life of the citizens and to increase efficiency and productivity of the urban economy that arise from the unprecedented level of connectedness will contribute to economic growth. The participating partners in RUGGEDISED are convinced that it will be through the adequate exploitation of opportunities that arise from the integration of smart solutions in cities that economic growth will emerge and that lasting societal acceptance for smart cities will be established.

The RUGGEDISED project will create urban spaces powered by secure, affordable and clean energy, smart electro-mobility, smart tools and services, innovative solutions and showcasing economic viability in order to significantly increase cities' overall energy and resource efficiency through actions addressing the building stock, energy systems, e-mobility, water and air quality. Particular focus will be on creating the right enabling frameworks for large-scale innovation at urban scale, including the development and testing of new business, financing and governance models that allow for quick replication at scale.

Excellence, utmost relevance and visibility of RUGGESDISED will be ensured through a High-Level Advisory Board of distinguished experts, architects and policy makers including Wolf Prix (Coop Himmelb(I)au), G. Colclouch (EIP-Smart Cities and Communities), Prof. A. Van Timmeren (TU Delft) and Prof. T. Olofson (Umea University).

Why this project is called RUGGEDISED.

The word *ruggedised* means "designed or improved to be hard-wearing or shock-resistant". The solutions that are being implemented by the cities in this project will make the cities resilient against future developments. The acronym is made up by the lighthouse cities **R**otterdam, **U**mea and **G**lasgow: **G**enerating Exemplar Districts In **S**ustainable Energy Deployment.

1.1 Overall aim and project specific objectives

The current period in which we live can be characterised by rapid technological development, strong globalization of (social and economical) activities, a need for protecting our living environment (climate, resources) and ensuring social stability. In RUGGEDISED, all partners will develop and test the knowhow to exploit the opportunities of smart solutions that are available and the knowhow to achieve a significant breakthrough in deployment and impact by these smart solutions.

The three overall aims of RUGGEDISED are:

- 1. **Improving the quality of life of the citizens,** by offering the citizens a clean, safe, attractive, inclusive and affordable living environment.
- Reducing the environmental impacts of activities, amongst others by achieving a significant reduction of CO₂ emissions, a major increase in the investment and usage of renewable energy sources and an increase in the deployment of electric vehicles (not only to reduce emissions, but also to enable smart grid balancing).
- 3. **Creating a stimulating environment for sustainable economic development,** by generating more sustainable jobs, stimulating community involvement in smart solutions (as consumers and as producers) and to boost start-up and existing companies to exploit the opportunities of the green digital economy and Internet of Things.

To achieve these aims, a key innovation challenge in all three lighthouse cities of RUGGEDISED is to arrange successful combinations of integrated smart solutions for energy and e-mobility (enabled by ICT platforms and open data protocols) and appropriate business models with the right incentives for stakeholders to invest and participate in a smart society. Specific challenges relevant for the lighthouse cities are:

- to manage peak load variation in thermal and electrical energy supply and demand;
- to develop appropriate cooperation structures and business models for exchange of energy;
- to develop Smart City (open) data platforms and energy management systems

RUGGEDISED has derived 10 specific objectives and planned **32 smart solutions** (13 in Rotterdam, 10 in Umea and 9 in Glasgow; see section 1.4 Ambition) to meet the challenges. The development of solutions in the lighthouse cities Rotterdam, Umeå and Glasgow is not the primary goal of the project, but a necessary means to find the right incentives and to create validated business cases to enable large scale deployment and replication of solutions. To this end, the three follower cities Brno, Parma and Gdansk have selected **27 smart follower solutions** (10 in Brno, 10 in Parma and 7 in Gdanks; including a replication plan) to closely folloe the lighthouse cities and to prepare for implementation in the near future.

The specific project objectives of RUGGEDISED are:

- 1. **Transforming three large districts of buildings (old, new and mixed) into low carbon and resource efficient districts** in which the buildings and management systems will be smart (i.e. featuring the latest generation ICT, controlled by smart meters, weather forecast based, making use of thermal energy). This also comprises the integration of local and regional renewable energy sources (e.g. wind, hydro, PV, solar thermal and geothermal) in the energy system and capitalizing also on synergies between energy sources.
- 2. Smart interaction and integration of energy systems (largely based on Renewable Energy Resources (RES) at district level to reduce the need to feed the local energy system with external and/or less environmental friendly energy-sources (e.g. the lighthouse cities can reduce the import of thermal energy from the city heating network if the energy is to a large extent generated, stored and exchanged at district and building level). This requires smart management of infrastructures for electricity, heat, cold and other grid systems (including water) and smart solutions for local energy production, storage and exchange of energy (e.g. using the storage capacity of e-charging infrastructure, electric vehicle batteries, and heat/cold storage facilities) to exploit synergies between these urban grids in order to increase efficiency and reduce energy costs.
- 3. Intelligent use of the thermal mass of buildings by utilising the buildings for thermal energy storage and exchange (e.g. between a swimming g pool and a theatre in the Heart of South district in Rotterdam, between a brewery and housing stock in Glasgow and between the hospital and university buildings in

Umea). This also includes peak load variation management using monitoring and governing platforms, connected to the internet, allowing communication through a smart grid cluster and the sharing of webbased statistics to increase efficiency and reduce energy costs.

- 4. Integration with and consolidation of low carbon and interoperable ICT systems at district level. For
 - example, a low power Long Range network enabling wireless battery operated applications, such as intelligent garbage collection, intelligent streetlighting, (e-) parking/charging guidance will be installed. In all lighthouse cities, an open 3D model, based on available open data of the district will contain a representation of the public space and buildings, making it possible to monitor communicate and all kinds performance of buildings), enabling endless applications and scalable to



information (starting with the energy Figure 1-1 3D model representation of Energy use of buildings in performance of buildings), enabling Rotterdam

digital city level. A final example of highly innovative smart solution is to provide high performance servers (Nerdalize Cloud) to home owners as cost free heating facilities, thereby creating a business model for highly distributed computing power while significantly reducing overall CO2 emissions¹.

- 5. Integration of smart charging hubs to balance the peak variation in the electricity network by charging buses, trucks, taxi's, private vehicles and e-bikes in central places in the district to facilitate electro-mobility. Charging stations in the district will be connected to RES and will enable two way flow of electricity. For example, Rotterdam will use its large bus station in the district for this purpose, Glasgow will use intelligent street lights as 'hubs' for charging and discharging and Umeå will focus on its bus stops to enable grid integration. The implementation of the e-charging infrastructure will be accompanied by the procurement of electric buses for public transport and incentives for local businesses and citizens to invest in zero-emission vehicles.
- 6. Creation of physical and virtual environments for stakeholder and community interaction and involvement. The lighthouse cities will enable so-called "Venture Cafés" where stakeholders (citizens, businesses, entrepreneurs, authorities, etc.) can interact about challenges and smart sustainable solutions in (the districts of) the city. For example, a Venture Café² serving as a meeting place for (young) entrepreneurs, and also as an information point for citizens to receive information about the Smart district and how to participate in the various solutions.
- 7. Acquiring of the **knowhow to adequately integrate specific technical solutions** in energy and e-mobility ('the hardware') with enabling ICT solutions ('the software') and appropriate business models ('the orgware') in the proper setting, which means with the involvement and commitment of all relevant stakeholders. This knowhow is acquired (derived) from the implementation of the smart solutions in the lighthouses and from the lessons learned during the process.
- 8. Validation of 'the hardware', 'the software' and 'the orgware' of Smart Cities by demonstrating that both technological and financial risks are low enough to trigger large scale investments in the (other) districts of the lighthouse cities (Upscaled Deployment), in the follower cities (Replication), in other European cities and regions (EU-replication) and worldwide.
- 9. Monitoring of the performance and evaluation of the impact of the integrated smart solutions during and after implementation of the integrated smart solutions for a period of at least two years in order to provide feedback to the lighthouse cities and the local partners and to provide recommendations to the lighthouse cities how to adjust deployment plans, investment plans and replication plans. For example, key performance indicators that will be monitored during the lifetime of the project are: carbon

¹ www.nerdalize.com

² E.g. <u>http://vencaf.nl/</u> in Rotterdam

footprint, energy use and RES generation, number of electric vehicles connected to the electricity grid, local air quality, investments and operational costs and generation of local jobs.

10. Dissemination of the outcomes of the project, *i.e.* the integrated smart solutions and the lessons learned particularly to City Interest Group (CIG). The CIG will comprise 20 ambitious European cities, which will be invited to join the CIG in the first year of the project

1.2 Relation to the work programme

RUGGEDISED addresses topic SCC-1-2016: "Smart Cities and Communities lighthouse projects". Table 1-1 gives an overview of how RUGGEDISED addresses the main challenge and scope of the call topic.

Specific <u>challenge</u>	How RUGGEDISED addresses the specific challenge of the topic
To demonstrate solutions at district scale integrating smart buildings, smart, energy storage, electric vehicles	RUGGEDISED will demonstrate in total 32 innovative and integrated smart solutions in the cross-section of energy, transport and ICT.
and smart charging infrastructures, using the latest generation ICT platforms (and infrastructure) based on open specifications and driven by user demands.	Basically, it is the knowhow to achieve the integrated solutions in energy and e- mobility, multi-stakeholder cooperation, societal involvement and exploitation of opportunities that will enable a successful transformation towards intelligent, user-driven and demand-oriented city infrastructures and services.
This should be accompanied by energy efficiency measures and the use of very high shares of renewables at the level of districts.	To enable investments in RES production and connection to the energy networks. More than 4,500 MWh/yr RES generation is expected to be added to the energy grids in the districts of the lighthouse cities.
Specific scope	How RUGGEDISED addresses the specific scope of the topic
Lighthouse cities develop and test integrated innovative solutions at large scale (at least district size).	RUGGEDISED will test and validate integrated smart solutions of energy, mobility and ICT (e.g. intelligent LED street lights in Glasgow with integrated EV charging functionality, wireless communications network, and air pollution monitors). RUGGEDISED lighthouse cities are championing smart solutions that are very
These lighthouse cities should become the most advanced cities in Europe and act as exemplars for their region. They are fully committed to implement their SEADs and sock links with the	novel and ambitious (e.g. Rotterdam will develop appropriate cooperation and business models involving all relevant stakeholders about a CO_2 and cost reduction of the thermal and electricity grid in the district). All three lighthouses have approved SEAPs (see table 1-2).
broader SIUD Strategies in the framework of the EU Structural and Investment Funds.	Regarding investments, for example the Rotterdam district "Heart of South" is heavily linked to the Integrated Territorial Investment (ITI) area under ESIF. As part of the ERDF operational programme, an Urban Development Fund (UDF) with the specific goal of stimulating investments in retrofitting buildings will be
Technologies should exist already or be very near-to-market (technological readiness levels TRL 7 and more). The innovation is in the advanced combination of these technologies and the accompanying business models that enable deployment at large scale.	set up for the ITI-area. Additionally, funds for innovation, heat transport and exchange investments and for proof-of-concept financing will be established. The City of Rotterdam is managing authority for the ERDF programme and is well positioned to coordinate upscaling and replication of the project with the various ESIF instruments that are in place or under development in the metropolitan region. For more details, see the deployment plan of Rotterdam (section 1.4.1). Umeå and Glasgow have similar deployment plans (section 1.4.2 and 1.4.3).
An important focus of this call is on replication of solutions to follower cities, that shall be fully involved in the project from the beginning and have within the project enough committed resources to deliver a replication plan	All technologies are already or are very near-to-market (TRL 7 and higher). In section 1.4, for each lighthouse city an overview is presented of the underlying technologies of the proposed smart solutions and their respective technological readiness levels.
of most (if not all) the solutions developed within the project.	RUGGEDISED's ambitious replication work plan provides the follower cities Brno, Parma and Gdansk with direct access to the smart solutions (e.g. peer-to-peer discussions and workshops, monitoring and evaluation data, details on business

Table 1-1 Overview of how RUGGEDISED addresses the specific challenge and scope of the call text

Proof of long term commitment of follower cities to replicate validated solutions will be part of the evaluation. They shall replicate relevant measures	models), empowers them with the capacity necessary to replicate and supports that with substantial resources for interaction with the lighthouse cities from the beginning of the project.
within a few years after the end of the	RUGGEDISED has a good geographical coverage among participating partners
project	and a diversity of 6 European cities. This will be further strengthened by other
project	interested cities through the City Interest Group. This diversity, and with the
Follower cities shall study the	narticipation of both local SMEs as well as hig global companies such as Siemens
lighthouse cities' solutions and plan	a large share of different markets will be reached. Deployment and investment
lighthouse cities solutions and plan	a large share of unreferring heres will be reached. Deployment and investment
how best to implement the successfully	plans for the three lighthouse cities are included, as well as replication plans for
demonstrated solutions in their city.	the three follower cities.
Replication can also benefit from active	
knowledge transfer through e.g. active	As outlined in the replication approach, Brno, Gdansk and Parma will utilise the
mentoring or staff exchange between	project to acquire the proper set of competences to become future lighthouse
cities.	cities. In other words, the 3 follower cities will start in January 2017 (the
	expected project commencement date) an empowerment process that will lead
	them to start the field implementation of the smart solutions indicated in their
	Replication Plans as soon as possible but not later than January 2021. Besides
	the Letters of Intent of the follower cities (see annex XX), the respective Mayors
	commit the follower cities to their Replication Plans (see anney VV)
	commutine ronower crues to their replication rians (see annex 11).

The projects should cover:	How RUGGEDISED addresses the specific scope of the topic
A larger district of buildings. These	The three lighthouse cities are committed to smarten each building in the lighthouse districts and to utilize the opportunities of smart interaction of
different sizes of the sities and the	different energy systems in order to achieve near Zero Energy Buildings (nZEBs)
land conditions and each building shall	Anort from straightforward monsures of roduce the energy demand, such as high
local conditions and each building shall	Apart from straightforward measures of reduce the energy demand, such as high
become smart, <i>i.e.</i> realturing the latest	performance (RR++) windows or root insulation (investments outside the
generation ICT, smart meters, smart	projects), the following <u>smart solutions</u> will be developed:
appliances, smart energy	- <u>Latest generation ICI</u> : 3D models of the district/city contain a representation
management, smart use of the thermal	of the public space and buildings, enabling monitoring and communication
mass; smart management of cooling	of all kinds and enabling endless applications, low carbon LoRa network with
(where applicable) etc. A larger	enabling various wireless battery operated applications.
number of smart buildings shall create	 <u>Smart meters</u>: microprocessor-based monitoring and governing units to
a smarter district through intensive	optimise energy management and use in multiple buildings according to the
interaction between the buildings for	building physics, tenant activities and consumption patterns
increased synergies and decreased	 <u>Smart appliances</u>: LED lighting, intelligent garbage collection, intelligent
costs.	street-lighting/e-charging, (e-)parking/charging guidance and city-wifi
	 <u>Smart energy management</u>: demand-side and peak load energy
Smart interaction of different energy	management between multiple buildings, weather forecast based control,
systems at districts level going far	etc.
beyond classical electricity grids	- <u>Smart use of the thermal mass</u> : heat/cold exchange between various types
management only: smart management	of buildings (between a swimming pool, theatre, exhibition centre and
of electricity, heat, cold, gas or other	congress hall, campus, hospital and student apartments, brewery and social
grid systems (including water) with	housing), pavement heat-cold collector, recovery of waste heat, etc.
smart solutions for storage including	- <u>Smart management of cooling</u> : (surface) heat/cold collection, storage and
the intelligent use of the thermal mass	use, seasonal heat/cold collection, storage and use, etc.
of. Integration with and/or	- <u>Smart interaction of different energy systems</u> : optimal thermal exchange
consolidation of low carbon ICT	between the city heating network and the district heating network to raise
systems at district level	the overall efficiency of the total system; smart utilisation of surplus heat
(communication networks, computing	and power from an industrial CHP in social housing apartments; smart
facilities, data centres).	integration of local and RES in the district's and city's energy system and
, , ,	further capitalizing on synergies between energy sources.
Electromobility (in line with Directive	
2014/94): smart EV charging (grid to	Each lighthouse city will integrate smart charging hubs for e-buses, e-taxi's, e-

vehicles (freight distribution and passenger cars) and e-bikes to facilitate electromobility in the district. The E-charging stations will be connected to RES and most whole energy system from a technical of the stations will enable two way flow of electricity. For example, a large hub at an e-buses station near a shopping centre, e-(dis)charging stations at parking garages, intelligent street lights as 'hubs' for charging and discharging and

vehicle and vehicle to grid) while

ensuring a positive impact on the

and economic point of view.

Attention should be given to locally weak or old grids.	intelligent transit station hubs at bus stops with minimal heat loss from (de)boarding procedures and with intelligent ticketing services
	Most e-charging stations will be capable of charging and discharging. Grid balancing (especially relevant for locally weak or old grids) will be arranged by implementation of demand side - and peak load energy management systems and appropriate business models. These business models should give benefits to e-vehicle owners for providing electricity while assuring sufficient battery power to reach home loading stations. The positive/negative impact of the deployment of high numbers of vehicles on the electricity grid will be assessed (see task 6.4).

Each lighthouse city should:	How RUGGEDISED addresses the specific scope of the topic
Significantly improve energy efficiency by innovative integration of existing buildings with new buildings (especially in areas of mixed use)	The three lighthouse cities will significantly improve the energy efficiency through implementation of the proposed smart solutions (see section 1.4 for the detailed descriptions) in their districts. The targeted overall improvement in terms of reduced CO ₂ emissions is 3.84 Mt/yr renewables, 3.7 Mt/yr for energy efficiency in Buildings and 1.8 Mt/yr for e-Mobility. A detailed justification of
Incorporate RES based to a large degree on a high level of local	these numbers and percentages can be found in Section 2.1.
resources. Integrate electricity fuelling	Each lighthouse city will incorporate high shares of RES utilising the city's specific situation and surroundings. All cities will utilise PV, hydro, wind, solar thermal, geothermal, waste heat and seasonal aquifers for storage. For example, Umeå's
infrastructure for electric vehicle fleets. The impact of the deployment of high numbers of vehicles on the electricity grid must be demonstrated	ambition is to become 100% climate neutral by 2018 through increasing energy efficiency to the max, high fraction of RES and use of wood as biofuel for heating during cold periods when other RES is insufficiently available.
Use ICT solutions for improved	Each lighthouse city will implement a smart open data information and decision platform. Basically, it is a (3D) model of the district that functions as an open
planning management, control and maintenance of physical urban infrastructures to enable better services for individuals and businesses.	data-platform and makes further innovation possible by making data available for everyone - the exact platform architecture and technologies of the core data/service city platforms will yet have to be decided for some cities. The cities of course will have the opportunity to dictate the requirements (e.g. open
Prove interoperability between software modules to allow an effective management of components and information flows. To this end, urban ICT platforms must be based on open specifications.	source-open standard). Standard open city GML will be used. Particular importance will be paid to the integration architecture in all three cities – Digital city project ESPRESSO will help develop a pilot for Rotterdam already). The infrastructure to access data of the platform is formed by the Wi-Fi and/or the LoRa network and linked to local data sources. The possibilities for all kinds of data streams that are already going through the city to be unlocked by a central platform, accessible for everyone, are endless. For example, providing public
Develop innovative Business Models to demonstrate that both technical and financial risks are low enough for large scale investments in all cities. Deployment plans for the lighthouse cities and quick replication in the	transport information, city tours with special offerings, commercial information, <i>i.e.</i> shops with tours through their virtual property, real estate agents can visualize their properties for sale. Eventually each citizen could have and manage its own virtual home. Of course, such an open 3D city platform requires adequate protocols about security, privacy and confidentiality and business models to accommodate various users and services.
follower cities and potentially other cities shall be submitted.	The RUGGEDISED partners are fully aware that the development of innovative business models is one of the essential conceptual elements needs to be demonstrated and that technical and financial risks of solutions are low enough for: a) upscaled deployment and investments in the lighthouse cities, b) replication of the smart solutions in the follower cities and c) EU replication in other European cities. In Section 1.3, the concept and the importance of finding the right incentives and business models to enable upscaled deployment and replication of solutions is explained in detail.

Table 1-2	City Sustainable	Energy Action	Plans (SEAPs)
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Partner City	Country	Adhesion CoM	SEAP approved
Lighthouse City of Rotterdam	The Netherlands	3/2/2009	March 2016
Lighthouse City of Umeå	Sweden	25/11/2011	March 2016

Lighthouse City of Glasgow	Scotland	28/8/2009	February 2015
Follower City of Brno	Czech Republic	In process	In process
Follower City of Gdansk	Poland	In process	In process
Follower City of Parma	Italy	16/5/2013	May 2014

1.3 Concept and methodology

1.3.1 Concept

As indicated in section 1.1, the key innovation challenge in all three light house cities of RUGGEDISED is to arrange optimal combinations of integrated smart solutions for energy and e-mobility (enabled by ICT) and the appropriate business models with sound incentives for the stakeholders (suppliers and (end)users) to facilitate large scale implementation and replication across Europe. The solutions that will be developed by the lighthouse cities are based on technologies that are at TRL7+ level **and** on the appropriate business models for large scale deployment and (EU) replication. Solutions are therefore not purely technical by nature, but involve a systemic approach and knowhow in order to bring innovations to the market successfully.

The concept of RUGGEDISED is based on four main phases that partly run in parallel:

- 1. <u>Implementation phase</u> of solutions in the lighthouse cities (including validation).
 - How can a technical solution (TRL7) for heat & cold exchange between two neighbouring buildings be upscaled to more buildings by using the right investment and business models?
- 2. <u>Up-scaling and deployment phase</u> of successful solutions on a larger scale by the local partners.
 - How can individual partners further exploit the opportunities for their city or business ("upscaled deployment")?
- 3. <u>Replication phase of know-how and solutions to the follower cities in RUGGEDISED.</u>
 - How can the follower cities immediately transfer useful solutions to their local contexts ("replication")?
- 4. <u>Replication phase of know-how and solutions to other (EU) cities and stakeholders</u>
 - How can other cities or stakeholders in Europe or beyond benefit from the lessons learned ("EU Replication")

The heart of the concept is formed by the **implementation** of suitable solutions for the challenges that are identified in each lighthouse city (as presented in section 1.1 and table 1-3) and that will help the lighthouse cities to become smarter and that will enable them to reach the targets set out in the SEAPs. The implementation is pushed forward by four driving forces that deliver necessary know-how for success (one particular example is presented about how this would work in lighthouse city Rotterdam; in other lighthouse cities the mechanism is the same):

- 1. **Integration of the smart solutions** in energy and e-mobility, supported by ICT and appropriate business and governance models:
 - These are the solutions that will be developed in the light house city districts for their challenges. For example, the city of Rotterdam will develop a smart (low temperature) thermal grid and storage facilities in the district area to reduce the need to import heat from the city district heating system. The thermal grid is connected to an energy management system by which demand and supply of heat and/or cold in the district can be monitored and distributed. Appropriate business & contractual models will be developed in RUGGEDISED to enable the financial & legal handling of energy transactions (the know how to do this will be developed in the project).

2. Multi-stakeholder cooperation

All necessary partners at local level need to cooperate to ensure a successful implementation of the solutions, e.g. the ICT partner and Energy Service Company cooperate closely to link the information about energy demand and supply in a district with the availability, so that the total external energy demand outside the district can be reduced. In the case of Rotterdam, the local partners KPN (ICT), ENECO (Energy provider), Ballast Nedam (building manager) and the city of Rotterdam (land owner and main public authority) will have to work closely together to achieve the optimal smart solution for the provision of heat/cold to the Heart of South district.

3. Societal involvement

The solutions that are developed in the lighthouse cities are not only beneficial for the cooperating organisations, but for all end-users in the area. Everyone in the district should be able to benefit from a lower energy demand and be able to contribute to it ("prosumers"). For example, when the heat/cold exchange between two neighbouring buildings in the lighthouse district in Rotterdam is achieved (a swimming pool and an art centre), then the overall energy costs will be reduced and e.g. ticket prices for the swimming pool can be reduced or municipal subsidies can be used for other purposes.

4. Exploitation of opportunities

How to stimulate stakeholders to invest in energy efficient solutions given the fact that the current business model is based on energy consumption. What should be the incentives for a lower energy demand? E.g. to have a *Chief Productivity Officer* (CPO) in the district that spots the opportunities for low energy solutions and that brings together the effected stakeholders ensures that it is implemented. In the case of Rotterdam, if heat & cold exchange (including the appropriate business and contractual model) can be achieved between 2 to 4 buildings, then it is also possible between other buildings in or outside the district. A CPO will be triggered by this potential and will initiate a further deployment of initiatives. Furthermore, a CPO is intensely aware of the urban demand which he will put central in his quest to exploit opportunities, and the cities' activities as defined in the proposal will thus be leading and shall be translated into business models. This aspect will have the CPO's focus during the project.

The **Implementation Concept** of RUGGEDISED is presented in Figure 1-2. The activities in the participating lighthouse cities Umeå, Glasgow and Rotterdam are represented by a cog-wheel that needs to be turned from its current to its targeted position (SEAP-goals achieved on top). The four driving forces described above will set the wheel in motion, by developing the integrated smart solutions, in a multi-stakeholder situation with societal involvement and effective exploitation of opportunities.



Figure 1-2 Implementation Concept

During the implementation phase, know-how is generated about how to achieve integrated smart solutions for the challenges faced by the light house cities. This know how will then be used for the **upscaled deployment** of solutions. Upscaled deployment is undertaken by the individual partner organisations in the consortium, for example partner KPN will roll-out their LoRa network (see frame) in other parts of the Netherlands, in cooperation with other local stakeholders. The lighthouse cities will each roll-out their solutions in other parts of the city with similar challenges.

About LoRa (just one of the proposed Smart Solutions, presented here as an example)

LoRaWAN[™] is a Low Power Wide Area Network (LPWAN) specification intended for wireless battery operated things in regional, national or global networks. LoRaWAN[™] targets key requirements of internet of things, such as secure bi-directional communication, mobility and localization services. This standard will provide seamless interoperability among smart things without the need of complex local installations and gives back the freedom to the user, developer, businesses enabling the roll out of Internet of Things. LoRaWAN[™] is easy to install, extremely economical, flexible to adapt, scalable, bi-directional, secure and encrypted

endless opportunities, Internet of Things enabled Monitoring. Controlling and locating expensive assets, processes or machines, provide data to increase efficiency, reduce energy bills for street lighting, smarter cities, parking guidance, optimised waste collection and consumer solutions in smart homes

The follower cities Brno, Parma and Gdansk will cooperate with the lighthouse cities of RUGGEDISED right from the beginning. In fact, cooperation structures already exist between these cities (e.g. Rotterdam and Gdansk have already a twinning cooperation). Their ambition is to **replicate** successful solutions in their local context. More information about their challenges and SEAP targets is provided in section 1.4.

The available knowledge and know-how will also be transferred to **other EU cities** and Smart City projects through the planned dissemination activities. In Figure 1-3 the deployment and replication concept and the link to the implementation is presented.



Figure 1-3 Deployment and Replication Concept

1.3.2 Approach towards the implementation and validation of smart solutions

The three Lighthouse cities, of which two are large dynamic cities of 600.000+ inhabitants and one smaller yet the fastest growing city in its country, have selected different focus areas, and offer multiple opportunities to learn from their demonstrated innovations.

In a joint effort, RUGGEDISED **delivers 3 clusters of replicable integrated smart solutions**: (1) Providing the cost efficient and sustainable energy infrastructures for a low carbon city / Peak load management, (2) Appropriate cooperation structures and business models to allow for energy efficient smart solutions by exchange of energy,

and (3) Smart City (open) ICT platforms /city 3-D model/energy management.

Peak load management entails that all three cities recognize a number one challenge: the difficulty of integrating high shares of renewable energy sources in their grids. Next to that all cities have taken on the challenge of optimizing thermal and electricity storage technologies as a means to stabilize their grids and make them more efficient, and enable the smart exchange of energy locally (connecting local production and consumption). The smart thermal grids in the lighthouse cities will be optimised by implementing storage facilities of heat & cold and to exchange thermal energy between buildings

Appropriate cooperation structures and business models are missing to a large extent in today's cities. This challenge means that the non-technological side of smart city development/the organizational and governance side, has been recognized as a challenge too and that the development of appropriate cooperation structures for multi-stakeholder cooperation is a priority. Business models furthermore will enable the upscaled deployment of solutions that are demonstrated once in the lighthouses possible (they become bankable solutions as a result).

Smart City (open) ICT platforms as well as open data protocols are recognized as vital ingredients for smart city development yet they are not yet fully developed at city level to an extent that they are usable for all stakeholders. Low carbon ICT systems at district level in their full functionality mean multiple communicating local networks, computing facilities, data centres and buildings all connected through on system. The smart energy management system included in such platforms will enable to control and manage the energy flows, including the information flows. First of all the demand and supply of (thermal and electrical) energy must be collected, after which a decision support system can be used. For example, Umea will implement such Smart Open Data platform, with specific solutions to develop for interaction with energy suppliers and users, management scenarios and control rights (including data ownership). Rotterdam and Glasgow will undertake similar activities.

RUGGEDISED' lighthouse cities have adopted a common approach that manifests itself in the following: a) all three have selected a number of smart solutions in each cluster described above, and b) a balance between smart technologies on the one hand and organisational and governance dimensions on the other. This approach allows them to deliver smart and inclusive solutions and to improve citizen's quality of life. While people ensure sustainability, industry the necessary technology, governance ensures large-scale replication through its systematic approach and institutional learning. The demonstrations in the three lighthouse cities are accompanied by local Urban Innovation Labs and are embedded in substantial collective cross-cities and crossparty development, learning and improving as well as intensive replication and dissemination to maximise the project's impacts.

The Table 1-3 summarizes the main solutions and measures to be implemented in the project, in order to meet the challenges.

uevelopeu			
Challenges		Main smart solutions implemented by the lighthouse cities	
1.	1. Providing the cost efficient and sustainable	Optimisation of the use of renewable energy sources (solar, wind, waste water, etc.) – see WP'S 2-4, Task Increase the energy efficiency	
	a low carbon city / Peak load management	Optimisation of thermal and electrical storage & exchange including e-mobility (heat pumps, external batteries, electric vehicles) to enable local production and consumption. – see WP'S 2-4. Task Increase the energy efficiency and Task Integration of E-Mobility	

Table 1-3	Overview of the common challenges in the lighthouse cities, including the type of solutions that will be
	developed

2.	Appropriate cooperation structures and business	Business models related to thermal and electrical grids (buying and selling of energy, demand response solutions, etc.) see WP'S 2-4, Task Increase the energy efficiency

	models to allow for energy efficient smart solutions by exchange of energy between end- users, prosumers etc.	Appropriate cooperation structures for multi-stakeholder cooperation (contractual models, public-private partnerships, citizens involvement) see WP'S 2-4, Tasks 1-5
3.	Smart City (open) ICT platforms / city 3-D model / energy management systems	Visualise Demand and Supply for Energy (virtual platforms using GIS, 3D-models, etc.) – see WP'S 2-4, Task Enabling low-carbon ICT solutions
		Data privacy and ownership – see WP'S 2-4, Task Enabling low-carbon ICT solutions
		Decision support tools – see WP'S 2-4, Task Enabling low-carbon ICT solutions

The project approach is summarised in Figure 1-4. The core of the projects is formed by the solutions that will be implemented by the lighthouse cities. These are embedded in WP2 (Umeå), WP3 (Glasgow) and WP4 (Rotterdam). As described above, all lighthouse cities face the same challenges, and the solutions they develop are to a very large extent very similar (although the local consortia differ). The solutions of the cities are clustered around thermal energy, electrical energy (and e-mobility) and smart energy management.



Figure 1-4 Simplified structure of RUGGEDISED (including link to the WPs)

WP1 (Cross-city Implementation and Innovation in the Lighthouses) functions as the facilitator regarding the cooperation between the lighthouse cities and ensures that the solutions are based on latest insights and knowledge on energy saving, system integration, energy storage, privacy issues, etc. Core support activities in WP1 are the initiation of so-called **liaison groups** for the common challenges in the cities. In the liaison groups, experts from the lighthouse cities regarding the **thermal energy, electricity & e-mobility, ICT and data platforms** and **business modelling** will be brought together. Experts from the selected follower cities are also invited to join these groups. In WP1, periodical support activities and workshops will be organised based on specific needs from the cities. A dynamic rolling agenda of activities will be developed.

Two ways of **multi-stakeholder cooperation** are foreseen. In the first place, each local partner is a member in the local consortium in each lighthouse city to implement the solutions (for example: City of Rotterdam, KPN, ENECO, Ballast Nedam, RET, Future Insight and Erasmus University Rotterdam). In addition, through the liaison groups members from the local consortium will interact with similar partners from the other lighthouse (and follower) cities. All partners are aware of and committed towards this cooperation. In the case of Rotterdam for example, the existing public-private partnership between city of Rotterdam, Ballast Nedam and partners was really boosted since the cooperation on Smart Cities started.

Regarding the **societal involvement**, all three lighthouse cities will initiate so-called Venture Cafés, physical places in the lighthouse districts where stakeholders and citizens can meet, where information sessions about e.g. energy saving will be organised and where new business opportunities can be explored and initiated. The **exploitation potential** of the smart city is expected very high and it is not possible to predict which opportunities will arise through the Internet of Things, multi-stakeholder cooperation and societal involvement. Therefore a

Chief Productivity Officer (CPO) will be appointed in each lighthouse district to spot and initiate the opportunities of the green digital and smart economy.

Approach towards monitoring & evaluation (WP5)

The impact of the solutions in the lighthouse cities will be monitored and evaluated. As the evolution of a city's infrastructure is a slow but steady process, monitoring of changes towards a smart district will be done over a long term. Therefore a two year post-implementation phase deals with the day-to-day running of the monitoring infrastructure and the collection of off-line data and qualitative feedback from citizens and other end users needed to get insights and validate the approaches. The goal is to provide project partners and stakeholders with visible results on the transformation of the district into a low energy district with integrated infrastructure and sustainable mobility.

Approach towards upscaled deployment (WP6)

Upscaled deployment requires an assessment of the potential performance of the technological aspects of the smart solutions in a larger scale or context. The analyses are mainly focussed on the socio-economic and energy system boundaries that may affect a certain technology to be implemented in a larger scale within the lighthouse cities. The project foresees a common approach for all the Lighthouse cities and their local partners and include:

- **Scenario analysis**: Developing possible future development in scenarios in order to assess influence on the potential of the smart solutions
- **Energy System analysis**: Simulating the effects on the urban energy systems from individual or combined upscaled smart solutions, thereby understanding the robustness and possible investment needs of the energy system in the Lighthouse cities.
- **Urban Innovation analysis**: Looking at the Socio-economic conditions around the smart solutions and pinpointing the Critical conditions (legal, tax related, political/administrative, financial) for upscaling.
- **Innovation Platform** : Setting up an institutional cooperation arena for partners to foster cross-border work within and between relevant stakeholders.
- **Business model incubator**: As a focus area of the Innovation platforms, setting up a structured approach and methodology for reviewing the results of the demonstration projects, as well as the before mentioned analyses, developing business models for a wider up-scaled deployment.

Applying a joint approach for the three lighthouse cities enable not only a fruitful opportunity for the cities to share and learn, but also allows for a close link to the follower cities. This will also mean a clear reduction of both financial and technical risks associated to upscaling and replication.

Approach towards replication to follower cities (WP7)

The associated follower cities (Brno, Parma and Gdansk) will follow closely the development of the smart solutions from the beginning of the project. They will, like the lighthouse cities, initiate a smart city governing group to interact with local stakeholders and will become active in the liaison groups of the project. By doing so, they can immediately transfer good practice or appropriate solutions to their local context. The follower cities have initial replication plans developed, that will be further elaborated and for which investments will be prepared (latest) towards the end of the project. Specific challenges for the cities of Brno, Parma and Gdansk are explained in detail in section 1.4.4.

Approach towards replication to other (EU) Cities (WP9)

Key towards the transfer of knowledge and experience towards other (EU and non-EU) cities is to organise dissemination activities beyond the traditional communication channels. For this purpose specific connections will be established with a City Interest Group of about 20 cities that will closely follow the activities of RUGGEDISED, among which the American city of Portland and the Indian megacity Mumbai.

1.3.3 Relevant (inter)national research and development projects

Table 1-4 provides an overview of the most relevant projects. Additional relevant projects can be found in section 4 of the RUGGEDISED project proposal.

Project acronym	Funding source/ period	Relevance to RUGGEDISED project proposal	Partners involved
Greencit – Green citizens of Europe	LIFE Plus	The overall objective of GREENCIT is to demonstrate how environmental policy can be interpreted and implemented into concrete citizen-oriented actions, which motivate and help citizens to change their behaviour. Three specific settings have been selected: individual apartments in residential areas; jointly used waste management areas in residential blocks and the intra-city-region mobility system	UME
Future Cities Demonstrator	Innovate UK (Formerly Technology Strategy Board)	Series of Smart City projects to demonstrate Glasgow as a 'future city'. <u>http://futurecity.glasgow.gov.uk/</u>	GCC
STEP UP ³	FP7 – Smart Cities 2012-2015	Enhancing SEAPs and developing innovative low carbon energy projects. <u>http://stepupsmartcities.eu/</u>	GCC
CELSIUS	FP7-ENERGY- SMARTCITIES-2012	CELSIUS results in state of the art district heating and cooling solutions. Strong linkage between RUGGEDISED and CELSIUS ensures that the state of the art district heating and cooling solutions resulting from CELSIUS will be implemented in the RUGGEDISED demonstrators and in the follower cities.	ROT, TNO, SP
FREVUE	FP7-TRANSPORT- 2012-MOVE-1	The European evidence base on the role of electric vehicles in urban logistics resulting from FREVUE will be applied in RUGGEDISED	ROT,TNO,
CityKeys	H2020 SCC-2-2014 2015-2017	CITYKEYS will develop a performance measurement framework for monitoring and comparing the implementation of smart city solutions.	ROT, TNO, AIT
EU-GUGLE	FP7 2013-2018	The EU-GUGLE (European cities serving as Green Urban Gate towards Leadership in sustainable Energy) project aims to demonstrate the feasibility of nearly-zero energy building renovation models in view of triggering large-scale, Europe-wide replication in smart cities and communities by 2020	SP
STEP-UP	FP7-Energy- SMARTCITIES-2012 - 2020	STEP UP is an energy and city planning programme that aims to assist cities enhance their sustainable energy action plans and integrate energy planning into their sustainable city planning. Twelve organisations are working with local government, research and commercial partners. Enhancing SEAPs and developing innovative low carbon energy projects. <u>http://stepupsmartcities.eu/</u>	SP, GCC
SINFONIA	FP7-ENERGY- SMARTCITIES-2013	Smart Cities-project, involving two demonstration cities and five early adopter cities. Demonstration projects on retrofitting, and energy efficient infrastructures. Research on scalability/replicability and energy system analysis <u>www.sinfonia-smartcities.eu</u>	SP
TRANSFORM	H2020 2012-2015	TRANSFORM is a project dedicated to the mobilisation of the procurement power of city authorities and major companies, with the aim to accelerate progress towards sustainable zero carbon transport systems.	ROT, ISINNOVA
NeZeR	Intelligent Energy Europe 2014-2017	NeZeR project promotes the implementation and smart integration of Nearly Zero Energy Building Renovation (NZEBR) measures and the deployment of RES in the European renovation market.	ROT
Scale up potential	European Commission – DG	Analyse Smart City Solutions best practice examples in Europe and worldwide; Analyse European Smart City Solutions replication potential	ISINNOVA

Table 1-4 Overview of relevant (inter)national research and development projects

³ Strategies Towards Energy Performance and Urban Planning

	ENER, 2015 Tender	and support actions; Analyse Smart City Solutions best practices of business models	
RES H/C SPREAD	European Commission, 2014 – 2016 IEE	The RES H/C SPREAD project aims to develop six pilot regional plans for heating and cooling from renewable energy. The project involves six pilot Regions pertaining to as many European countries representing the EU main climatic zones, with a prevalence of the Mediterranean nations. The planning exercise aims at setting harmonized and standard baselines to better allow the developers to set their targets and policies. <u>http://www.res-hc-spread.eu/en_GB</u>	ISINNOVA
SCIS	Contract no – ENER C2/2013- 463-SI2.691121 2014 – 2017 Service Contract	The Smart Cities Information System (SCIS) brings together project developers, cities, institutions, industry and experts from across Europe to exchange data, experience and know-how and to collaborate on the creation of smart cities and an energy-efficient urban environment. Launched with support from the European Commission, SCIS encompasses data collected from ongoing and future projects under the CONCERTO initiative and Smart Cities calls in Horizon 2020. With a focus on smart cities, energy efficiency, transport and mobility, and ICT, SCIS showcases solutions in the fields of sustainable building and district development, renewable energy sources for cities, energy efficiency and low-carbon technology applications. <u>http://smartcities-infosystem.eu/</u>	AIT
Smarter Together	EC-Horizon 2020 (SCC-01) 2016 – 2020	SMARTER TOGETHER's overarching vision is to find the right balance between smart technologies and organizational/ governance dimensions in order to deliver smart and inclusive solutions and to improve citizen's quality of life. SMARTER TOGETHER gather the European Lighthouse cities Lyon, Munich, Vienna, the Follower cities Santiago de Compostela, Sofia, Venice and Kyiv and Yokohama as observer cities bringing the perspective of East Europe and Asia. The cities are complemented by business partners from energy, mobility and ICT sectors, leading European research and academia organizations, European city network. From the various combinations of the different selected Light House areas, multiples opportunities to learn are offering.	AIT
Grow Smarter	EC-Horizon 2020 (SCC01) 2015-2019	GrowSmarter aims to stimulate city uptake of 'smart solutions' by using the three Lighthouse cities (Stockholm, Cologne and Barcelona) as a way to showcase 12 Smart City solutions: from advanced information and communication technology and better connected urban mobility, to incorporating renewable energy sources directly into the city's supply network. www.grow-smarter.eu	ICLEI
Triangulum	EC-Horizon 2020 (SCC01) 2015-2019	Triangulum aims to stimulate city uptake of 'smart solutions' by using the three Lighthouse cities (Manchester, Eindhoven and Stavanger) http://www.triangulum-project.eu/	KPN
Greencit – Green citizens of Europe	LIFE Plus	The objective of GREENCIT is to demonstrate how environmental policy can be interpreted and implemented into concrete citizen-oriented actions, which motivate and help citizens to change their behaviour. 3 specific settings have been selected: individual apartments in residential areas; jointly used waste management areas in residential blocks and the intra-city-region mobility system	UME
Future Cities Demonstrator	Innovate UK (Formerly Technology Strategy Board) 2013-2015	Series of Smart City projects to demonstrate Glasgow as a 'future city'. <u>http://futurecity.glasgow.gov.uk/</u>	GCC

1.3.4 Gender aspects

The RUGGEDISED project and its deliverables aim to support a wide array of stakeholders (public, private and third sector). In no way there is any intention to favour specific persons and parties or to exclude access. As is clear from Articles 2 and 3 of the Treaty on European Union, gender equality is a requirement for all activities relating to the European Union, including in innovation actions in the frame of H2020. This is not only to eliminate inequalities, but also to promote equality. The RUGGEDISED consortium is aware of the pro-active stance that the EU takes on creating equal opportunities between men and women. The involved partners have committed themselves to gender equality and will actively promote the participation of women in this project and all of its activities.

1.4 Ambition

In this section, the lighthouse and follower cities are presented in more detail. This includes an overall description of the cities, their ambition, the specific challenges they are facing and the solutions they will develop in RUGGEDISED. All lighthouse cities are investing heavily in the transformation of the selected districts towards smart, livable and zero energy districts in the upcoming years. RUGGEDISED is regarded as a great opportunity to facilitate this transformation and to enable a further integration of solutions, cooperation between stakeholders and involvement of society, therefore bringing the smart cities to a higher level.

Furthermore, the deployment and replication plans of the cities are briefly described in this paragraph.

1.4.1 Lighthouse City Rotterdam: Heart of South District

The city of Rotterdam is situated in the south-west of the Netherlands on the river 'de Nieuwe Maas' and is the centre of the region Rijnmond (1.6 million inhabitants). The Rotterdam harbour is one of the world's leading harbours. The harbour is the largest of Europe and the harbour-industrial complex is stretching out for more than 40 kilometres from the inner city to the new developed Maasvlakte 2 in the North Sea. The maritime and industrial cluster in the harbour directly gives employment to over 90,000 people.

Table 1-5 Demographic data

Demographic data			
Area (km²)	206		
Population (city)	630.000		
Density (inhabitants/km ²)	3054		



Besides the harbour, the city of Rotterdam today has some other main features which are characteristic for the city's economy. The city is well known for its famous and challenging architecture and has also a huge medical university which can be defined as world famous for multiple topics. Furthermore, the city has a long history in trading and logistics. Nowadays, the city of Rotterdam has the ambition to develop the service sector, especially the creative sector, in a broad sense. The tourist industry is growing rapidly, which is boosted by modern architecture and significant improvement of the inner city. More and more tourists from all over Europe and the world are discovering the city of Rotterdam to visit for example the new market hall, the new central station, the Erasmus bridge and the south-bank city development. Price winning innovative architecture and city planning have become mayor city-assets.

Policy context of the city, urban challenges and ambition of Rotterdam

The city of Rotterdam has gone through a serious transition in the past sixty years. After the second world war, Rotterdam and its harbour were growing rapidly due to the economic prosperity in those years. Because of some radical economic developments, like automation in the harbour, employment changed from so-called blue-collared work towards more white-collared labour. This had serious social economic consequences that are still relevant, especially in the south of Rotterdam. Poverty, unemployment, deprivation, multi-cultural tensions and low levels of education are occurring to a (too) large extent. The dynamics of today's economy are still increasing.

Besides the social-economic challenge, the city of Rotterdam also acknowledges its responsibility to contribute to mitigate the climate change in a more than robust way. Rotterdam, as part of the Rhine-Maas delta, indeed is extremely vulnerable for uncontrolled impacts of the climate change.

The city of Rotterdam takes into account the socio-economic and climatologic challenges and sees good opportunities to make the right steps ahead. The city of Rotterdam will be ready for the future and is defining (supported by strategic global consultant Jeremy Rifkin⁴ and his TIR Consulting Group LCC) an investment strategy (the so-called Roadmap Next Economy) to make sure that the necessary economic transition in the entire region will be achieved. The transition from a mainly fossil fuel driven economy to an economy based on the use of sustainable energy sources will be organised within the next decades, providing opportunities to significantly stimulate a circular economy.

The above mentioned developments are strongly boosted by the dynamic and rapidly growing ICT-sector. The use of internet, big data, robotics and sensor techniques will have enormous disruptive effects on existing business models. It is crucial to understand how the city should respond to these changes to be competitive and ready for the future. The goal for the city of Rotterdam will be to achieve the necessary transitions in the near future in such a way that the inhabitants of the city of Rotterdam profit in the best possible way.

Smart District Heart of South: challenges and solutions

With enthusiasm Rotterdam wants to introduce the Heart of South area as the Rotterdam Lighthouse district. The Heart of South district is a very large area (re)development of approximately € 330 million in the centre of the south of Rotterdam⁵. As said, the South of Rotterdam faces relatively severe social-economic challenges, like low education levels and unemployment, accompanied by a young and multi-cultural population. The area currently is dominated by a car-oriented infrastructure where citizens and visitors sometimes feel estranged.

The Heart of South district will undergo a serious transition in the upcoming years, consisting of the sustainable renovation of an out-dated shopping centre, the renovation of the public transport hub both, as well as various large-scale multifunctional buildings (like a swimming pool, arts building, exhibition halls, congress center and so on). Furthermore, the public space in the area will be drastically redeveloped. With a focus on the Heart of South, the city of Rotterdam will prepare the district for the future with the aim to achieve maximum energy efficiency and CO_2 reduction, in addition to the aim to achieve major social economic impact as well (jobs, new levels of participation of citizens, quality of life etc.).



Figure 1-5 Geographical situation of the Heart of South District and Artist impression redevelopment city centre Rotterdam-South

The entire renovation and the construction of the new buildings were innovatively tendered together with a twenty-year maintenance of the area by the municipality of Rotterdam. A coalition led by Ballast Nedam won the tender in 2013. The actual renovation and construction of new buildings will start in 2017 and will be finished totally in 2023. With the Heart of South project the municipality of Rotterdam as well as Ballast Nedam underline an enormous ambition for the area. And this ambition can be improved substantially by adapting the challenge to connect buildings, mobility, energy sources by using ICT-systems in a smart way. Ballast Nedam, KPN, Eneco, RET, TNO, Erasmus Universiteit Rotterdam, Future Insight and the city of Rotterdam as RUGGEDISED partners will work together to achieve these ambitious goals. Getting connected is the key message!

⁴ <u>http://www.thethirdindustrialrevolution.com/</u>

⁵ <u>http://www.hartvanzuidrotterdam.nl/</u>

Within the Heart of South project the total investment of the redevelopment of the entire area and the maintenance for 20 years will be approximately 330 M \in . The total costs of construction of the buildings will amount to 200 M \in , the rest being reserved for maintenance. The renovation of the Ahoy exhibition halls, the new to build congress centre, the building of the swimming pool in a former office building, the new arts building and the renovation of the bus and metro station amongst others will be financed within this budget. To realise the ambitions planned in the Rotterdam lighthouse project an additional 10.6 M \in in total will be invested, of which 3.1 M \in is requested as a grant from the European Commission in RUGGEDISED.

The large buildings in the Heart of South give good opportunities for PV and urban wind, the amount of PV added is extraordinary. All suitable roofs will be used for PV: on the various buildings more than 12,000 m² of PV will be realized with a total maximum capacity of 2 MW. With the production of 1.8 million kWh more than 850 tons of CO_2 will be reduced. For peak shaving on the energy supply side, the combination of solar and wind is a good solution: they are complimentary to each other. When it's sunny weather there normally is not much wind and when it's cloudy it's often windy, the position of Rotterdam close to the shore is also beneficial. Therefore 100 urban wind turbines will be realized on the Congress center Ahoy which will produce 150,000 kWh and reduce 72 tons of CO_2 . A part of the PV is reserved for charging the battery storage off grid via a DC cable for the fast charging point for electric busses, a solution to raise the efficiency and to reduce the peaks on the energy demand side.

The public-private partnership between the city of Rotterdam and Ballast Nedam is the most far-stretched form of public-private partnership to date. Never before a project with this scale and scope was tendered as a single PPP-project. Ballast Nedam was selected after a tender in which the amount of 'social value added' was the ultimate selection criterion. The physical interventions in the area include the renovation of the Ahoy complex, the addition of an international convention centre, construction of a new swimming pool, theater and library and the redevelopment of the bus station. Moreover, the entire public space is radically redesigned to connect the various functions with each other and thus allow for a true city centre experience. Ballast Nedam is responsible for the design, construction, financing and maintenance of both the property and the public space.

Special attention is paid to maximising the social impacts of the upgrade. This manifests itself in providing learning- and workplaces for those who experience difficulties entering the labour market.

But also in organizing events to positively highlight the area. By doing this the entire area is made more interesting for its residents and business and new target groups are attracted. By supporting easy involvement and participation of citizens to urban development, e.g. via better opportunities to effect and give feedback, BN significantly reduces e.g. urban planning timescale and amount of complaints about new plans. The zoning plan was created in an interactive co-creation and planning process to involve the population in the plans and the area. Residents of the area are involved in the urban planning process through value engineering sessions. Hereby BN improves the sense of collective ownership of the area, and thereby strengthen the social network in this part of Rotterdam South.

In the zoning- and urban plan process BN developed the knowledge to involve stakeholders in an interactive planning process so that maximum support is created among the population.

It is exactly this knowledge that will be utilized to increase support for solutions such as the Geothermal heatcold storage and heat pumps and the Energy Management system. The challenge is not only in the technical application of solutions, but certainly also in the organization of a region-wide collaboration in which all stakeholders contribute to the realization of an energy neutral area. The interactive approach by Ballast Nedam involves all major stakeholders in the region, without losing attention for the individual home-owner. Involving all stakeholders in the process is an important condition for realizing an intelligent, user-driven and demandoriented city infrastructure.

Further, the City of Rotterdam recognizes not only the importance of employment of its citizens but also the importance of career development. Individual factors like level of education, ethnicities and age play a major role and often this concentrates in specific areas like in parts of the Heart of South with high unemployment, many low educated people and high concentrations of immigrant groups. In addition to these individual factors, other important factors is the role of employers and of entrepreneurs⁶. They are the ones that create work,

⁶ McGurk, P. (2014). *Employer engagement: a human resource management perspective.* University of Greenwich

recruit people (or not) and they are the ones that can offer career development paths. Not only as individual employer, but also as group or as regional group.

Therefore, the City of Rotterdam will create an environment (Venture Café) to engage entrepreneurs and employers in the Heart of South to address shared values like employability, sustainable developments, innovation, liveability and social responsibility.

For this purpose, the City of Rotterdam will also pro-actively initiate additional projects aiming at employability and career development in the Heart of South backed by co-funding via EFRO and/or ESF programmes. In the following tables the solutions that the city of Rotterdam and its partners will develop in RUGGEDISED are

presented.

'Gooilandsingel'

Further information on the elements can be found below:

Description of the building



A beautiful new designed avenue will connect the different buildings in the project. It will mainly accommodate pedestrians and re-create the whole experience of enjoying city life in 'Heart of South'. The experience will be a safer, more pleasant and proficient boulevard than it has been in the last decades. A place to be, to stroll and to be seen before going to a concert, theatre performance or on a shopping spree.



'Bus and Metro station Zuidplein'

'Shopping Mall Zuidplein'

Opened in 1968 the bus and metro station near the shopping mall has grown into the second largest in The Netherlands (yearly over 12 mln passengers). The bus and metro station will go through a major redevelopment in the next few years, with the aim to realize a more efficient, user-friendly and sustainable building.

The Mall was built in 1972 with, at those days, modern American car orientated examples as inspiration. The mall with over 160 shops, nowadays still has 10 million visitors a year, spread over 190 different nationalities. In the new development the



mall will have a better connection with the Urban structure of the area, enhancing the accessibility and overall experience. 'Rotterdam Ahoy'







'Swimming Pool'

of South' urban regeneration project.

A new (competition standard) 50 meters swimming pool will be built in the former office building 'Charlois'. By doing so this reconstruction will match perfectly to the sustainability standards of the municipality. The pools will be built on the first floor, resulting in space on the ground floor for diverse functions that can help the vibrancy of the area.

The Rotterdam Ahoy buildings contain an international conference centre, a concert hall, a theatre and auditorium. The existing Exhibition & Event Halls are being extensively modernized. The construction and refurbishment form part of the 'Heart

'Building for the Arts'

This will be the heart of the cultural experience in the South of Rotterdam. It will house a theatre, a library, exposition areas and different stages all accompanied by hospitality. The building will offer a place for art, reading, entertainment, education and information. The open character of the façade will dissolve the boundary between interior and exterior, so it ends up being part of the urban texture of the area.

Business School Working Paper #WERU7.

Smart solutions in the lighthouse city Rotterdam

The actual implementation of solutions in the lighthouse cities are clustered in thermal energy, electricity and e-mobility and energy management systems. The three

of solutions of course interact and will be approached in an integrated way and are all linked to a specific challenge.	User Relationships		According to the REAP- strategy energy is re-used and stored, instead of wasted. With the city of Rotterdam as the owner of most of the buildings with a public function, the citizens in the city of Rotterdam will profit from the lower TCO	According to the REAP- strategy energy is re-used by using heat or cold from district sewage water. With the city of Rotterdam as the owner of most of the buildings with a public function the citizens in the city of Rotterdam will profit from the lower TCO.	BN together with ROT will operate this surface water heat/cold collection to contribute to achieve the desired thermal balance	Ballast Nedam together with the city of Rotterdam will operate this collector in the public space to contribute to achieve the desired thermal balance
	Upscaled Deployment		Because of the diversity of functions and peak demands on different times, a lower total base load can be engineered which saves on installations and increases energy efficiency. The thermal grid can be scaled up by connecting other buildings besides the already planned ones in this Lighthouse project. With this experience and knowledge this concept can be rolled out to other parts in the city where buildings with different functions can be connected.	This smart solution will be transferred to other parts of the city when sewage replacement is planned and when the use of waste streams is identified as beneficial. By doing so large parts of the city of Rotterdam will be able to use these waste energy streams in combination with aquifer thermal energy storage (ATES).	The added value of the measure for the city is to make surface water instrumental for the smart geothermal grid. ROT has lots of large open waters, which are suitable for this. This will result in making the thermal grids of the future even more efficient	Especially at places with slow traffic like pedestrians and cycling routes in combination with the presence of sewage waste heat or aquifer thermal energy storage, this measure is deemed effective and will therefore be used later elsewhere in the city of Rotterdam
	TRL	GRID	00	8	×	×
	Key Activities	SMART THERMAL	The challenge is to elaborate an extensive heat and cold storage and exchange system based on a low-temperature thermal Grid, and to connect at least all of the existing buildings and some new parts of the area, such as the Exhibition centre Ahoy, Congress Centre, Arts building and swimming pool, to this thermal grid with a lower total cost of ownership (TCO) as a result. For this a thermal distribution system is built. To maximise the use of waste heat and cold, existing seasonal aquifer thermal energy storage (ATES) (heat-cold storage) is optimised.	The challenge is to use thermal waste streams as much as possible. Thermal energy from the waste water of the showers in the swimming pool is retrieved to pre heat the hot tap water without storage. On district scale, heat/cold from sewage water from households will be recuperated and used in the geothermal smart grid. Depending on the demand it can be used directly or stored for a season, regenerating the storage and create a thermal balance. With a 60 meter long heat exchanger in the big sewage system, up to 120 kW of power can be regained. The waste heat of the cooling system of the Congress Center and Exhibition center Ahoy can be used to heat the Arts building, this gives an additional efficiency of 30% besides the measures on building scale.	Since the buildings which are connected to the smart geothermal grid use more heat than cold, a balance should be created by adding heat to the storage system. Surface water nearby Ahoy and Hoornbeeck College will be used to provide this.	The challenge is to create a balance in the geothermal heat- cold storage system. By putting a heat exchanger under the surface in the pavement/road, heat and cold can be extracted from the surface and stored in the heat-cold storage system. In wintertime the bus slope to the bus station will be kept free from snow and ice as well as a "red
	Consortium members		BN, ENECO	ROT ROT	BN, ENECO	BN, ENECO, ROT
	Smart Solution		Geothermal heat-cold storage and heat pumps	Thermal energy from waste streams	Surface water heat- cold collection	Pavement heat-cold collector
clusters	Code		R1	R2	R3	R4

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		RET and Eneco will use this knowledge together to realize a maximum coupling of RES and mobility. The solution developed can and will be upscaled within the city of Rotterdam.	Using the knowledge of smart storage of RES will lead to lower energy bills of citizens and building owners. Peak shaving will be made possible and costs of unnecessary increasing of grid capacity can be avoided.	As owner of the RET the city of Rotterdam will have a modern and well equipped transport company, which is ready for the future. Sustainable and businesswise.		Eneco as an energy company will in this project optimize
	OBILITY	In the near future when more e-mobility is used and generated this measure is needed to enlarge the grid capacity. The DC-cable is future ready and can cope with 3 times more charging demand than now foreseen. The battery system is modular and can be extended when needed.	Smart parking lots can be out rolled eventually through the rest of the city. By using cars as storage for electricity the total needed electric grid can be designed and constructed at lower dimensions which will lead to lower costs.	By making the bus fleet more sustainable in the South of Rotterdam, this knowledge can and will be used in the rest of the public transport domain of the RET. In total at about 250 conventional buses will be replaced. Improvement of the air quality in the entire city and region will result, as well as a reduction of the carbon foot print of the RET-operations.	cī	The energy management system as an operation system between several buildings with different
	D E-MO		∞	∞	AND IC	~
carpet" for pedestrians from the public transport station Zuidplein to the Exhibition center Ahoy.	SMART ELECTRICITY GRID AN	The local grid is not ruggedised for providing all the power for quick charging electric busses of the RET-fleet. Furthermore the existing electricity grid at the bus station cannot cope with effective balancing of demand and supply of renewable energy. Since there is suitable roof space available close to the bus station, PV will be placed there and deliver the energy directly off grid to the battery storage at the bus station via a DC cable. This battery system is modular and can store 600 kWh of electricity, the DC cable is designed future proof for 300% more electrical power. By using DC all the way, the avoided DC-AC and back conversions will increase the energy efficiency with around 15%. The over capacities of the PV will be fed back into the area electricity grid. The coupling of PV and quick charging electric busses (360 kW) will demonstrate that integration of these systems is beneficial. Charging infrastructure for e-busses will be included .	Since the area electricity grid is almost at its maximum capacity, it's effective to have smart charging points that can cope with 2 way energy flows (grid to vehicle and vehicle to grid) to minimize peak loads. In the area 25 smart car charging points will be realized. If in the future variable electricity prices are there, the car can be charged for the lowest energy prices, which indirectly stimulates a better usage of RES production.	The challenge and innovation is to introduce zero emission (e)-buses successfully on a large scale, starting with 6 and aiming at 40 this coming years while at the same time the reliability of the timetables of the public transport at all situations and at all times has to be guaranteed. The reliability of the needed ICT planning software has to be 100% and has to be tested and developed in real time to experience the effects on the logistic operations. For reaching the optimal result, including the exploration of city distributions, actual simulation models of the Erasmus University Rotterdam will be used as well.	ENERGY MANAGEMENT	Since the thermal and electric smart grid are quite complicated, it's important to manage all energy streams. This is done for
		ENECO ENECO	BN, ENECO	RET, EUR		BN, ENECO, EUR
		DC grid, PV and storage for mobility	Smart charging parking lots	Optimising the E-bus fleet of RET		Energy Management
		R5	R6	R7		R8

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the energy management system itself but will also use this knowledge for the management of other projects.	The introduction and the further development and expansion of the 3D city operations model by Future Insight will make market innovations possible. Both the city of Rotterdam as well as private (consortium-) parties will use the model for new applications to also create new businesses.	t KPN's roll out of the LoRa network makes further innovations possible. Both the city of Rotterdam as well as private (consortium-)parties will use the LoRa network for new applications.	The city of Rotterdam will benefit from the replacement by LED-luminaires and the ALIS telemanagement application by citywide reduction of the use of energy of around 30%.	The citizens of Rotterdam will benefit from this since they reduce their heating demand drastically.
functions can and will be used elsewhere in the city to match supply and demand of energy of these buildings efficiently. It will contribute to optimise the exchange of energy.	Future Insight and ROT expects that further innovation will be extracted when the 3D City operations model is launched and becomes operational. Especially the further development of the model can create lots of market opportunities. But it is up to the market to explore these opportunities. The city of Rotterdam has also the aim to discover and analyse boundaries of such a 3D approach (e.g. privacy matters of the sharing of data), but sees this as a challenge to search for counter measures which will make the existing technology far more ready for practical use.	KPN will roll out the LoRa-network across the resi of the Netherlands, so that the rest of the country can also use the network to create all kinds of innovative (sensor-) techniques.	In the near future, in all city districts where tele management will be installed, the AliS ICT protocol will be supporting this. The management of the public lighting in the city will become more effective and efficient.	The computing power is being sold to different clients, as of industry and academics where it can be put to good use. Uses can include, medical research video transcoding, complex engineering
	~	8	œ	∞
maximization of use of RES and to lower the energy losses. The demand side as well as the supply side should be measured and monitored well, in order to make good energy management possible. Essential is the share of data from the individual buildings with the other buildings. Not only by the planned rollout of smart meters, but also by a smart coupling of the building management systems. By making the information open source, all building users can see how their building is functioning in relation to other buildings. So preventive maintenance and energy efficient behaviour is promoted.	The data on the use of energy of the buildings as mentioned will be matched and transferred into a new 3-D city operations model that will be developed. This model shows and visualises the actual use of energy as well as the use over a period of time of the individual buildings as well as the whole area. This 3-D model functions as an open data-platform and makes further innovation possible by making data available for everyone.	The introduction of the LoRa-network operated by KPN makes transport of data far more efficient and easier. This network will make all kinds of sensor techniques in the Heart of South area possible (and later on in the entire city and furthermore), like public lighting, waste management and so on. At low costs, because the used technique ensures that therefore Wifi or nowadays still expensive 4-G is not required and needed.	Fixtures in the Heart of South area will be replaced by LED luminaires, which are equipped with modern sensor technology to lower the energy demand. So lighting intensities can be adjusted to the real time needs of civilians passing by. Through remote management using the so-called LoRa-network the system can be managed centrally. To achieve this, a newly developed open ICT protocol called AIIS (Astrin Lighting interoperability Standard) is implemented.	The Nerdalize Cloud is a sustainable and affordable high-end compute platform. Because the servers are distributed over many homes you don't have to pay for the overhead of a datacenter This means that costs per job is up to 55% lower
	FI, ROT, EUR, KPN, BN	NAM	BN, ROT	ENECO
	3-D City operations model	LoRa-network	Efficient and intelligent street lighting	Nerdalize eRadiator
	68	R10	R11	R12

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The city of Rotterdam will benefit from this measure because of the savings of energy. Citywide estimates are that at least 20% less kilometres will be driven
From one to many - After the pilot in Rotterdam South for a route to retrieve waste paper and after analysis and any amendments thereof, the system is provided to roll out the measure to other types of waste before the end of 2018.
σ
Challenge is here to lower the energy use of vehicles for waste collection by monitoring the degree of filling and optimizing the route of the collection trucks. Smart waste traffic is achieved by using sensors to measure the degree of filling of the containers. For transporting these data the (possible) use of the LoRanetwork will be explored and the data will be monitored via a central portal.
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t Waste Igement
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1.4.2 Lighthouse City Umeå: Smart Campus District

Umeå is located on the Ume River, 600 km north of Stockholm. The climate of Umeå is subarctic, with short and fairly warm summers. Winters are lengthy and freezing but, considering the latitude, very mild due to the influence of the Gulf Stream. Average January temperature is about -8 °C, August is 16 °C; the HDD Heating Degree Days is 4,855 and CDD Cooling Degree Days is 98. Considering its proximity to a major water body and its latitude, summers are hotter than expected and can be compared to coastal areas on Sweden's west coast much further south.



Demographic data		
Area (km²)	2,317 km2 (municipality) 34 km2 (City de-limits)	
Population	120,000 inhabitants	
Density (inhabitants/km ²)	3,529 or 52 inh/km2	

Figure 1-6 Umeå's map, location and demographic data

Umeå is the biggest city in Norrland, the capital of Västerbotten County and the 11th biggest city in Sweden. When the university was established in 1965, growth sped up, and the amount of housing has doubled in the last 30 years, which means the city has been expanding since 1975 (75.290 inhabitants) and it exceeded 100.000 inhabitants in 1995. Umeå has more than 120.000 inhabitants in 2016 but two-thirds of the population is born outside the municipality, with around one tenth from outside of Sweden. In total, 100+ nationalities are represented in Umeå, the top 10 from Finland, Iran, Iraq, India, Norway, Somalia, China, Ethiopia, Germany and Russia. The average age in the municipality is 38 (2011), which is three years below the national average and is explained by the large student population; Umeå is a centre of education, technical and medical research in Sweden, with two universities and over 39.000 students. Each year (2011), 700 to 800 new apartments are constructed. The city was elected European Capital of Culture in 2014, and was shortlisted for the European Green Capital award in 2016 and again in 2017.

Two European highways cross Umeå: the E4 and E12. Three car bridges cross the Ume River in the city, Tegsbron (opened 1949), Kyrkbron (1975) and Kolbäcksbron (2001). In Holmsund (15 km to the east) is Umeå harbor with handling of goods and a ferry connection to Vaasa, Finland, Umeå's nearest city. The international tourist route Blå vägen (Blue road) (Norway-Sweden-Finland-Russia) passes through Umeå. The Botniabanan high-speed rail link (opened 2010) connects Umeå to the south with Hörnefors, Nordmaling and Örnsköldsvik (40 minutes, 110 km) and onwards to Stockholm. A new travel centre, Umeå Östra, also opened in the university/hospital area in Umeå. Umeå airport is only four km away from Umeå city centre and is Sweden's seventh largest airport (2011), passing one million passengers in 2014. The unemployment rate is 5% and the employment rate of people between 20 to 64 years old is 76%. The public sector (municipality, county council/hospital services and Umeå university) is the main employer. The private sector in Umeå is quite diversified with IT, research based on biotechnology, forestry and the engineering industry well-represented. Six of Umeå's export companies have turnovers higher than 100 M€/year.

Policy context for the city, urban challenges and ambition of Umeå

Smart city thinking is at the core of the City of Umeå's overall vision of continued social, economic and environmental sustainable growth, and this is outlined annually by the City Council as well as in the six development strategies adopted in the city-wide master plan. From a smart cities perspective, this results in the will to develop the city as a whole, focusing on:

- More efficient land use to optimise efficiency of new urban qualities in a growing city, such as additional

housing, green spaces, etc. This implies working to reduce needs for car parking, new solutions for urban drainage systems etc., as addressed in this project's smart solutions. This will be an important contribution to the city objective to reduce fossil CO_2 emissions by 50 % by 2025 (compared to 1990).

- More public transport, cycling, walking (this share should be 65 % of total city residential travel share by 2022), as addressed in this project's smart solutions (see below).
- Less car use, and promoting transfer to more sustainable motorised transport modes (e.g. electrified public transport, electric cars) to reduce climate impact, but also reduce noise and air pollution etc., as addressed in this project's smart solutions.
- Smarter energy system solutions, with lower climate impact, integrating grid owners and property owners and involving end users to reach the objectives of a climate neutral energy system by 2018. Building on the city's move towards a climate neutral energy system, coupled with rapid urban growth, incurs a smart focus on curbing maximum power usage in developing the city, as is the outlined joint strategy of the partners in the innovation area of the University city, also addressed in this project's smart solutions.
- Open up relevant data created in the district to generate new knowledge and engagement with citizens, research, planners and other strategic uses, as addressed in this project's smart solutions.

With access to open data, and active involvement of monitoring, evaluation and research in the project, new opportunities for knowledge sharing open up, to the benefit of all parties. As one complementary example, in 2015-2017, researchers from Umeå University with interdisciplinary competences (technology, ICT, behavioural and social science) will work on a connected project that has received Swedish Energy Agency funding, with a demand-side perspective on:

- Testing and evaluating existing smart technical solutions for energy savings and smart mobility (to and from home, work, studies and visits) to the Umeå campus area, and seeing how this can lead to reduced energy use.
- Increasing knowledge of human energy-related behaviours and investigating how these can be move in a more energy-smart direction, based on current energy- and transport-related policies.
- Developing and implementing cross-sectorial sustainability criteria for refurbishment and new construction of homes and public buildings, with the aim of generating social benefits/added values in terms of energy efficient and sustainable regeneration.

Various plans are impacting Umeå's smart city context and ambition, among which the SEAP (approved in March 2016), a City Masterplan and an In-depth Masterplan for the campus area. In the **City Master Plan**, six development strategies are outlined, based on the Aalborg commitments (signed in 2008) and the city council objective of sustainable growth to 200,000 inhabitants by 2050.

- 5-kilometre city The dense city! The growth should be concentrated within this radius from the city centre and the University area.
- More city! Complementing as a vitalizing force, merging the city to a more coherent urban landscape
- Create high density in new districts. New adjoining blocks strengthen and develop services and urban life
- Growth in public transport corridors and conversion of traffic throughways. New dense block development planned alongside alleys benefitting public transport
- Invest in public spaces and parks! In the dense city, the public spaces should be attractive, safe and full of experiences, with room for recreation and greenery
- Everybody shall participate! All planning must be imbued with openness, democracy and gender equality

In the same way, the **University City In-depth Master Plan** (2013) outlines a vision of a district with education, research, health care and area-related business development at the highest international level.

- City-life promoting activities at street level with entrances along the main passages/corridors.
- Prioritized passages for education and health care in cooperation, along with research-related business development.
- Clear urban structure with mixed use: business, housing, service and retail.
- Urban block structure in a coherent street network improved orientability around the main entrances to the regional hospital.

- Open spaces to create points of orientation.
- New housing and business establishments in Nydala stad, Hamrinsberget, etc.
- Hospital care establishments eastward, research and development in the northern part of the district.
- University development in the campus compact zone.
- Coherent green passages.

Smart District Umeå: challenges and solutions

In RUGGADISED, Umeå will focus on an Innovation District that is situated immediately to the east of Umeå city centre, the University city area, including a mix of residential, academic and research facilities from two universities, a regional hospital, and community, recreational and commercial buildings. RUGGADISED will facilitate a unified 'smart district', which is underpinned by planned regeneration and new developments, existing smart city capabilities and committed public and private sector investments of at least 600 M€ in the period 2016-2025⁷.



Figure 1-7 Umeå Smart Campus Innovation District (similar to University City area in-depth master plan, adopted in 2013), and adjoining strengthening areas

Umeå is the fastest growing city in Sweden north of the Stockholm region. The University City area is the largest workplace hotbed in northern Sweden, and has both local, regional, national and international relevance. Despite its close proximity to the city centre, the Campus Innovation District has historically not always been perceived as an integrated part of the city. The neighbourhood is characterised by its young, student-influenced, population. As such, the neighbourhood is one of the least car-dependent neighbourhoods in Umeå. For example, the share of cars in the district is only 33% compared to the citywide 54%, and the share of bikes is 42% (citywide 25%). This makes the University City an interesting district for new smart solutions and business models that are more dependent on prevalent sustainable mobility options. The boundary for the Innovation District is defined in the map above, covering 1.56 km2 in total and currently just over 3,000 inhabitants, 12,000 employees and about 40,000 daily visitors. The district comprises seven sub-areas/neighbourhoods, each with its own characteristics and development agenda, as part of the whole outlined in the area master plan. Also included are adjoining neighbourhoods, all with different connections to the district.

Further details on each element can be found in the following table:

⁷ <u>http://www.thecore.se/tv_flash.swf</u>
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Smart solutions in the lighthouse city Umeå

The actual implementation of solutions in the lighthouse cities are clustered in thermal energy, electricity and e-mobility and energy management systems.

User Relationshins		UE is the driver of the development as energy company, in cooperation with the energy customers VCC and AHAB.	UEAB, energy company and system owner. AH property owner University & housing area VCC property owner, hospital buildings and flat tenants	VCC is owner of the land- and the geothermal storage, provider and consumer of the heat/cold. AHAB: provider of surplus heat/cold and consumer. UEAB is the owner
Upscaled deployment		The business model developed in the project will if successful, be up scaled and applied in all of UEs business area. This is a part of the overall goal of UE to become 100% climate neutral during the project, by 2018.	Peak Load management will be tested and refined in the innovation area. There is an expectation to upscale the solution in all public areas of the city (UE is the system/grid owner of the whole region). The power controls will be installed in all of the Umeå Campus buildings, 265,000 m ² of premises and have the potential to become standard in all properties of the innovation area. The partners have a planned investment of 600 M€ in new buildings in the area.	The VCC investment budget for new hospital premises is an estimated 50 M £/year during the 5 year project. A successful business model can be deployed everywhere in the county were VVL have geothermal storage. New local actors will be incorporated and thus scale up the benefits of geothermal stocks.
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Key Activities	SMART THERMAL GRID	Demonstrate business model to add value of shared energy solutions, to optimize PV/solar energy production and battery storage, possibilities for control and optimization based on a smart grid concept. A challenge is the quality issues and optimization from an overall perspective, how could we further develop the monitoring, power quality, prevent disruptions etc. All actors have to be involved in the process of optimization in a cooperative manner. Action include an analysis of peak load and energy durations at an aggregated level of the district, define and establish optimization boundaries for top load shaving, energy optimization and more. UEAB will, together with the other partners, establish a business model testbed. Actions included are: Identify value proposition, cash flow, stake holder dependencies, risk mitigation and more. All will be monitored and measured for evaluation and conclusions.	A: By using the buildings as thermal energy storage it is possible to even out peak load variations of the buildings, whose structure itself functions as an accumulator of heat energy. Depending on the composition of the structure of buildings, more or less heat can be stored and used for "load shaving". The energy management units are will be configured to communicate with other buildings in an open network cluster where a web-based information platform will be developed and results shared for benchmarking purposes. B: Umeå campus room types vary from dry office and teaching facilities to the energy-intensive wet labs and computer rooms. Tests with manual control simulating the automated energy management have shown that the peak power demand at Umeå Campus can be reduced at least 15 % with smart energy management. Automated power controls with ICT tools will be implemented, thus leading to less fossil fuel consumption during peak load time.	A development of a business model for sharing of a geothermal heating/cooling storage. The challenge is to secure the delivery of heat and cold during the extreme variations of climate/temperature in Umeå. The underground storage could be loaded from all operations/buildings and used by all when needed. One operation may have an excess of heat/cold when the other is in need of it. The advantage of the innovation area is that that the users operate at different times during the day and also during the year. By mapping the exchange of heat & cold in the smart network, we can show how the small scale production in the area can integrate the with the large scale production, in order to receive the best system utility on the total. The impact
Key Partnershin		UEAB, AHAB, VCC	UEAB, AHAB, VCC, SP, UU	VCC, AHAB, UEAB
Smart Solution		Smart City connection to 100% renewable energy	Peak load variation management and power control	Geothermal heating/cooling storage and exchange
Code		U1	U2	U3

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			is optimization and streamlining of the heating and cooling capacity available and a business model, built on a sharing economy instead of the ownership of the production.			of the business model
С 4	Intelligent building control and end user involvement	uu, vcc ,sP	 A. An intelligent and integrated control system for the internal climate will be installed in new apartment buildings in the university city demonstration area, with the potential to allow for the continuous analysis of energy performance as well. By modifying ICT suited for commercial buildings, AH will develop a system for private homes. The energy usage in a building. The integrated control system will enable exploring how incentives can make the tenant choose to put their flat in "home or away- mode". The purpose of this action is to lower the energy consumption of the building and to involve private homes in the improved energy performance of the whole area. B. AHAB will install automatic smart control equipment to control air volumes, room climate and lighting for the presence and needs of 130 offices at the University area. The rooms connected to a parent monitoring where settings can be made and the current status reported and stored. This action will reduce heating in better climate for the workers. 		A. The action will be tested in aprox. 60 apartments. Next phase is 200 + 700 apartments and an additional 1,000 apartments will be built in the area during the project – investments in flats L2 M€ (private – and state funds). A political goal of Umeå is to build 2,000 new apartments every year to meet the demands. 3. The University holds 265,000 m² of premises where this action will be up icaled. The hospital is building a new ication/hospital wing (90 M€) were this olution is planned. VCC holds 650,000 m² of facilities were the action may be proscaled Planned investments of 2 \mathcal{M} €/year (regional authority) for VCC, or improvements in building indoor limate.	AHAB and VCC are the property owners. UEAB energy company. SP the technical specialists. UU, Private tenants and workers (University and hospital)
			SMART ELECTRICITY GRID AND E-MOBILITY			
C	Energy optimised electric BRT-station	UME, UPAB, AF	1 The demonstrated electric buses are designed to operate in the cold climate of northern Europe, but a challenge is the heat and energy loss during the boarding procedures and the bus needs to be heated inside. In order to handle the heat loss, consequently and ensure range capabilities, every time the bus stops to let people in and out in the busy innovation area, a new electric "Bus rapid transit station" hub will be developed within the campus area. These will be provided with shelters, heating systems, an intelligent ticket identification system using smartphones before boarding and an insulation structure to minimize energy loss from the boarding procedures.		The target of the public transport in Umeå authority and public transport in Umeå and the region is to become 100% fossil ree by 2020. During the project, 33 electric buses will start servicing the area and the city. The City of Umeå will nvest 19 M€ in public transport nessures such as electric bus stop solutions, cuch as energy optimised electric BRT- tations and other supporting actions connected to the electric bus stations. .ocal and national funding.	AHAB, owner of the land property, UME owner of public transport company, UPAB the mobility company (to be part of the business model of solution U7). UME. Public transport company., the workers, patients of the hospital and students and residents of the area
N6	E-charging-	UEAB, AHAB,	E-charging facilities will be installed by UEAB, AH and VCC to ensure the roll	8	rhe City of Umeå, together with AH are	UPAB manager of

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parking and provider of dynamic payment system. UE owner of the electricity grid. AH owner of the hub. VCC, AHAB and UEAB investors of the chargers.	UPAB as the parking/mobility company will together with the property owner (AH) set the framework of the business model. UME has the monopoly of the planning, and sets legal conditions for the building and development. UME will monitor and measure the traffic.		UME owner and user of planning tool UE - owner/. AH, owner VCC – owner of data
investing in 3 new hubs the first year of the project, with private and public local funding of 1 M€. The city of Umeå is aiming to upscale the solution - 8 new hubs during 4 years (if proven successful). UE are investing in 40 new charging points, aprox. 2 M€ (25 % from ESIF) and VCC are investing in 2 super charging points 200,000 €, possible in connection with other E-hubs. The interest from other private real estate builders is strong as this is a very cost effective measure for them (as part of the Green Flexible Parking Pay off – solution U7) This is a political goal and a term for private property development in the city.	9 UPAB will invest in 5 new multi storey parking facilities during the project, private and public funding of 40 M€. Private property developers (as AH) will in return for the use of the space for their tenants, be investing the equal amount public transport, e-charging infrastructure, e-car sharing etc. This is a model that the city of Umeå will implement in all new housing developments. The target is to build 2000 new homes/ year in Umeå.		7 In the beginning of the project data from all partners will be used (+ some additional actors) , but as the platform is developing, UME will invite more actors to be part of the platform. The cost of upscaling will not be large as,
out of electric vehicles in the area. A charging hub for e-vehicles will be tested by AHAB and UEAB, with charging facilities for e-bikes, e-cars and car-share. By installing PV plants along with energy storage, advanced monitoring and governing systems and charging points of electric vehicles within the innovation area, good results will be gained in terms of reducing building energy consumption, as well as systemic effects such as decreasing peak loads. Different batteries and storage solutions will be tested within the project. As E- vehicle charging adds strain to the power system a smart power control management-system, including a dynamic payment system for the charging, will be tested. We will also seek to explore how this small-scale PVs can integrate with the overall system in the best way and how the battery storage can be up scaled.	The activity will focus on cooperation structures for multi-stakeholder cooperation by implementing a new business model. The purpose is to enable a reduction of car parking spaces and directing developer investments from parking towards sustainable mobility solutions (e-car sharing, e-buses, e- cycling etc), thus reducing the climate impact and overall energy use. The business model will be an extended version of the Green Parking Pay-Off model that has been developed for commercial buildings in Umeå, and will now be applied to residential buildings. The evaluation model designed for a pilot study indicates a 41% potential for modal change from car to sustainable modes, when all the conditional sustainable mobility measures are implemented. According to the evaluation to the Smart Open Data fossil fuels (40+ %) is expected from the introduction of the business model. This will be enhanced by the integration to the Smart Open Data Infrastructure. Some of the data collection needs to be complemented by traffic and movement sensors that will be analysed to monitor the progress - but also processed into information services (by web & & app) for people living-, working- or visiting in the area. As part of the Pay-off model, the property builders will invest in for example E-car chargers and E-car share system for the new residential areas (U6).	Energy Management and ICT	Integration of existing and new ICT solutions into a Smart City Data infrastructure based on Open Data principles, and connection to a City Decision Support platform. The infrastructure will provide data of the city's energy consumption, energy production, buildings and technologies involved and human behaviours, travels, complemented by non-technical artefacts such as business models, support processes etc. The people's need to access the
VCC, UPAB, UME	UPAB, UME, AHAB		UME, UU, AHAB, UEAB, UPAB, VCC, SP
hub/charging infrastructure (e-bike, private car, taxi, car- share), storage and exchange, and optimisation of the integration of RES in the grid	Energy-efficient land use through flexible green parking pay off		Smart Open Data city Decision platform
	5		U8

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s automatic integration and interpretation (for machines/PCs) when developed, can be used by meaning/definition of the data created with different semantic ll also be considered in the infrastructure's design. The local cooperation of Swedish cities. In the regional and nationa cooperation of Swedish cities. In the semantic cooperation of Swedish cities. Separately from each other they may be used for smaller of e.g. energy performance etc., but integrated with each other a potential to improve energy savings through collaboration and static. on a district- and city level.	versity with its 250,000 m ² of area in total every strategic a management drives energy use. Developing multivariate or predictive analytics which will support the decision process inant area use is the most powerful way to reduce energy of the end user. Facility services adaption trough predictive ed from the flow of students connections to the wireless net. is such as cleaning of floors, technical standby and waste trough connections to the wireless net. is such as cleaning of floors, technical standby and waste trough connections to the wireless net. is such as cleaning of floors, technical standby and waste trough connections to the wireless net. is such as cleaning of floors, technical standby and waste trough connections to the wireless net. is such as cleaning of floors, technical standby and waste trough connections to the wireless net. is such as cleaning of floors, technical standby and waste trough connections to the wireless net. is such as cleaning of the goals. VCC with 6 m ² of area and a goal to lower th energy consumption by 15% by 2 will seek to implement the solution will seek to implement the solution will seek to implement the solution interverse the solution we can lower the solution we can lower the solution the hours when facilities
data, as wel based on th techniques, lighthouse p example on behaviour e improvemel they have h knowledge,	AHAB, UU, The Umeå L JME decision in a analysis too concerning i concerning to consumptio analytics de Facility serv managemer flow of peol by behaviou enormously manage beh

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1.4.3 Lighthouse City Glasgow: Smart Corridor District

Located on the west coast of Scotland, Glasgow is a densely populated, post-industrial city which has developed from a carbon-intensive manufacturing base in the 19th century to a modern city focused on a low-carbon future. As the biggest city in Scotland, Glasgow is the economic engine and main commercial hub in the region and Scotland. The city alone generates £17 Billion per annum of Gross Value Added (GVA) to the Scottish economy and the city centre is the largest and most successful retail centre outside of London. Figure 1-8 provides the Glasgow location man and some high level demographic and socio-economic data on the city of Glasgow.



Demographic d	ata
Area (km²)	175
Population	593,245
Density (inhabitants/km ²)	3,390

Figure 1-8 Glasgow location map and Demographic data

There are profound disparities across the city in terms of income, wealth and opportunity. Glasgow experiences some of the highest levels of poverty and deprivation in Scotland. Almost half of Glasgow's residents (285,000), live in 20% of the most deprived areas in Scotland. Between 2012 and 2013 24% of households were presumed to be in "fuel poverty" (over 10% of household income - including Housing Benefit or Income Support for Mortgage Interest - is required to meet fuel costs).

- In 2012 the entire city was declared an Air Quality Management Area (AQMA) due to high levels of NO₂ detected across the city, and although this was lifted; the city centre is still designated as an AQMA. The city has a large road network, which includes a number of motorways that combine into two main motorways running through the city centre, which many vehicles use every day.
- The city produced 3,411 kilotonnes of carbon dioxide in 2014; particularly from dwellings and industrial buildings. The city has established a target of 30% CO₂ reduction by 2020, for which it is on target to achieve through projects like a waste to energy plant, district heating and community renewable energy projects.

Policy context for the city and concrete urban challenges

Glasgow is committed to long-term plans for transformation and sees the benefit of deploying smart city solutions in order to create a sustainable, connected and healthy city. This will be achieved through innovative smart city approaches, like the Future Cities Demonstrator; tackling environmental, infrastructural and socioeconomic challenges and providing resilient solutions that integrate with Glasgow's strategic priorities. Some of Glasgow's key Smart City projects are:

- Sustainable Glasgow is the city's partnership for driving its ambition to be one of the most sustainable cities in Europe over the next 20 years. It brings together a range of partners from principal sectors with the aim of achieving progress across environmental, social and economic aspects of sustainability. One principal objective is to ensure that Glasgow achieves a 30% reduction target in CO2 emissions by 2020. Sustainable Glasgow has a SEAP as a guiding strategy for transition to a low carbon future.
- The Energy & Carbon Masterplan (ECM) was initiated through the FP7-funded STEP UP (Strategies Towards Energy Performance and Urban Planning) Project. STEP UP sought to build on the original SEAP enhancing its actions and make it more robust. The ECM will achieve Glasgow's carbon reduction target through strategic actions like a waste to energy plant and district heating.
- 3. In 2014 Glasgow was named as a member of the **Rockerfeller Foundation's 100 Resilient Cities**. Glasgow is developing a strategy that will help increase the resilience of the city in five key areas identified through engagement across the city: health & wellbeing, economy & society, infrastructure & environment, leadership, and strategy.

- 4. In 2013 Glasgow was awarded £24 million (32 M€) to act as THE UK demonstrator site for Smart City capabilities for Innovate UK. The Future City Glasgow programme developed an operations centre which integrates traffic management, security, and public space CCTV; a City Data Hub which hosts open data in health, energy and socio-economics; applications encouraging citizen engagement in active and social transport; mapping analysis of the city to identify opportunities for renewable energy; and Intelligent street lighting with sensors to demonstrate public safety and energy efficiency.
- 5. The **Digital Glasgow programme** aims to make Glasgow a leading digital city by 2020, establishing it as a centre of digital innovation. Through this programme free Wi-Fi access in the city was secured for the Commonwealth Games in 2014. The telecommunications provider BT have shown that this was used 250,000 times through 40,000 users during the 2014 Games.
- Glasgow has responsibility for coordinating the Scottish Cities Alliance's 'Smart and Sustainable' strategic theme. Through this role Glasgow has a mechanism to engage and disseminate to other Scottish cities. Glasgow is also lead partner on the European Regional Development Fund programme for Smart Cities; 'Scotland's 8th City – the Smart City' focussing on Smart Infrastructures, Smart Services, Smart Communities and Data;
- Glasgow is involved in a trans-European Interreg consortium. The Programme; BE-GOOD, is led by the Dutch Ministry for Infrastructure & Environment. The project looks at using Open Data to improve public service delivery by engaging with innovative businesses / SME's to develop commercially viable and scalable Smart City solutions, around infrastructure, environment and city resilience;
- 8. Glasgow is developing two collaborative project proposals for the **ERDF** Programme. Firstly, Intelligent Street Lighting builds upon the demonstrator from Future City Glasgow. It will bring further control, quality, enhanced safety and a more proactive approach to maintenance and looks at how lighting can support smart parking, Living Labs, energy and waste management.

Smart District Glasgow's: challenges and solutions

Through the RUGGEDISED project, Glasgow will focus on creating a 'Smart Corridor District' that is situated along a section of George Street and Duke Street in the city centre, which has a mix of residential, community, academic, retail and industrial facilities. The Smart Corridor will address the challenges Glasgow faces from ageing infrastructure, fuel poverty and air pollution; by integrating planned regeneration and development with smart city capabilities.

The corridor district has many offices, university buildings and houses which citizens and visitors use varying forms of transport to reach. Glasgow has a complex road network made up of five motorways running through the city centre.

On the corridor, Drygate is a densely populated area with a high level of its residents facing **fuel poverty** due to high fuel costs and electrically heated housing.

Investment plans relevant to the Smart Corridor and the wider city include, but are not limited to: ScottishPower Energy Networks' extensive plans to upgrade its **ageing infrastructure** across the city to improve network resilience; the Council's plans for installation new street lights across the city over the next 20 years; and the Wheatley Group's investment plans for its stock to improve energy efficiency and the delivery of heat and power to its residents. This ageing infrastructure brings high energy costs and frequent need for repair.



Figure 1-9 The extent of the Smart Corridor District

Further details on each element is as follows:

Description of the building

Glasgow City Council Chambers are made up of four buildings, some of which are Victorian. These have served as the city government's headquarters since 1889. The council possesses approximately 21,000 employees, and these buildings house a large proportion of this number.

Tennents Caledonian Brewery was founded in 1740 and is now owned by <u>C&C Group plc</u>. The company produces Tennent's Lager, which is the leading brand of <u>pale lager</u> in Scotland. It has plans underway to develop a district heating system at the brewery and connect Drygate flats to this.



Picture of the building

University of Strathclyde campus includes buildings for teaching, research, administration and student accommodation. There are 300 student residences for over 1800 students spread across nine buildings. The dense University campus has a high heat and electricity demand.



The **Drygate** development was built in 1961. It is a social housing estate in Dennistoun, Glasgow, managed by the Wheatley Group housing association. There are a total of 293 properties –three eighteen-storey tower blocks and a number of 4 & 5 storey blocks. This area faces much deprivation; with low income, health, employment and education level.



Collegelands housed the University of Glasgow buildings from 1563 to 1870. The site was used by the <u>city railway</u> before it was rationalized in 1968. It was recently part of a wider regeneration project and now houses offices and a nine storey car park. The remainder of the site will be developed into a hotel and 400 homes.

The **Meat Market Site** is part of Collegelands but is being developed for social housing. This was the site of Glasgow's meat market, but was closed in the 1800s. It has remained derelict for a number of years. A new development will see 400 homes developed on the site.

Smart solutions in the lighthouse city Glasgow

The solutions proposed in Glasgow are innovative and integrate many challenges and opportunities. The solutions look at concentrating electric vehicle charging infrastructure whilst improving air quality; and tie this in with other significant challenges such as widespread infrastructural decay and affordable warmth for citizens. On the same thread, infrastructure upgrades will be undertaken with multiple smart objectives in mind, such as the integration of services and resources available in a localized but sustainable area. By way of example, street lighting can be integrated with a publicly available wireless communications mesh, which can be used to control electric vehicle charging; whilst using locally generated renewable energy. More affordable warmth can be addressed by using waste heat and energy from local business; and greater energy efficiency and security of supply can be achieved through demand side processes that assist the local electrical network. Tapping in to isolated assets in an area such as the Smart Corridor and integrating and linking these assets can provide a solution to multiple challenges, creating a sustainable, linked system. By taking a systems approach that marries infrastructures common to all cities the project becomes more easily replicable and can be used to implement similar networks and systems that work to address multiple challenges facing urban areas now and in the future. The package of solutions proposed along the Smart Corridor aims to:

- 1. Maximise consumption within the district from local generation of heat and power from combined heat and power engines, and renewable energy generating assets;
- 2. Increase electric vehicle charging facilities and proliferation of electric vehicles in the district, significantly improving air quality and reducing transport related CO₂ emissions;
- 3. Demonstrate that electric vehicle charging, intelligent street lighting and other such controllable loads (for example: buildings) can be incorporated into a demand-side management system, utilising the street lighting Central Management System and associated communications network to facilitate connection of these smart controllable 'devices' across the city that can support both generation fluctuations and provide localised electrical network support;
- 4. Create business models that enable local generators and consumers to contract with each other for the purchase & sale of heat & power;
- 5. Develop an analytics engine to inform the upscaled deployment of the solutions implemented through this work package.

The solutions proposed have been designed so that they integrate to make the best use of energy.

To this end, Glasgow has compiled 10 individual solutions to address its challenges:

- A solution to create a viable business model for building integration into a district heating networking, helping to negate the effects of fuel poverty;
- 4 technical solutions providing energy storage solutions integrated with renewable and low carbon innovative energy generation; plus a solution to create a better network of electric vehicles within Glasgow and across Scotland, streamlining and integrating services to electric vehicles;
- 4 ICT solutions for more efficient use of energy and the electrical network, as well as informing strategy and decision making.

Smart solutions in the lighthouse city Glasgow

The actual implementation of solutions in the lighthouse cities are clustered in thermal energy, electricity and e-mobility and energy management systems.

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Upscaled Deployment		Using the Scottish Government heat map, there are identified a number of regions in the city where district heating could provide an increase in energy efficiency and affordable warmth. Delivery of the identified networks will require £80M in investment and deliver benefits of 10,000 tCO ₂ saved. The funding from these networks will come from national grant funding, private investment, and recycled profit from other DH networks. Funding = GCC, TCB, WG, US time + Sub contractors (legal & financial expertise)		Glasgow City Council owns 7 multi-storey car parks. In addition, a number of private car parks exist in the city. Successful delivery of the battery storage linked to EV charging will result in deployment of this technology in GCC owned car parks alongside EV charging deployment with an investment requirement of over £3M. Additional work will be done to engage private car park owners regarding deployment on their sites.	Euture deployment of this technology will depend on a number of factors such as ownership and operation of assets, being aligned. The specifi deployment opportunities will be developed in the project. Funding = GCC, TCB, SPPS, SIE time	GCC owns 7 multi-storey car parks. Also a number of private car parks exist in the city. Successful delivery of the innovative RES installations, aligned with battery storage linked to EV charging will inform deployment of this technology in the remaining GCC owned car parks alongside EV charging deployment. The project will be used to encourage privately owned car parks to adopt the same technology. This will require roughly $5M$ (7 M€) and will be funded through public / private investment.	Glasgow City Council owns 7 multi-storey car parks. In addition, a number of private car parks exist in the city. Successful delivery of the battery storage linked to EV charging will result in deployment of this technology in GCC owned car parks alongside EV charging deployment with an
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Key Activities	THERMAL SMART GRID	Use of surplus heat from Tennent Caledonian Brewery (TCB) by a local housing association owned by the Wheatley Group (WG). Use of surplus heat from University of Strathclyde (UoS) DH network in Council headquarters. This project will develop the business models required to allow public sector buildings sell heat from one to the other and for private industry to sell heat to local housing, either directly or via an intermediary, such as the city ESCo. This is an organisational challenge.	SMART ELECTRICITY GRID and E-MOI	Battery storage to support the integration of electricity generated by PV and wind turbines, discharge to EV chargers, and act as grid balancing mechanism. Technological and business case challenge linked to the physical deployment and connection of battery storage onsite, as well as understanding how energy is purchased from local generators, provided to the battery and sold by the storage provider either to local points of consumption or to provide grid balancing services.	The technological challenge to have energy distributed from TCB CHP to battery storage for later use in city systems, such as EV charging. Business model required, both technically and operationally. The former requires the technical evaluation of how the energy flows to battery storage influence the generation priorities of TCB and the load profile of storage. TCB will establish a business model that facilitates power transfer from CHP to battery, and includes the resale of the energy from the battery. The regulatory challenge in relation to the potential distribution cost of using the local grid.	This is a technical and business case challenge, specifically in relation to the potential connection of urban wind turbines to the battery storage without a physical, wired connection, instead utilising an innovative system of netting off generation against consumption in assets owned by GCC, e.g. netting off the power generated by the turbines against the consumption of the car park, via the battery, thus freeing up potential placements for the turbines. It also concerns Roof Mounted Solar PV Canopies.	The challenge is to develop the business case for concentrated deployment of EV chargers, alongside the connection of those chargers to renewable technologies and battery storage. The charging infrastructure will be funded by TS with the innovative connection to renewables and storage
Key Partnership		GCC, TCB, WG, US		SIE GCC / TS	TCB/SIE	GCC	GCC/TS
Smart Solution		Heat and Cold exchange - Connection of buildings to district heating network		Battery storage technology as grid balancing mechanism & Supply of RES to EV charging and battery infrastructure	TCB CHP surplus power storage in EV Charging hub battery storage	Optimisation of the integration of near- site RES, potentially liked into battery storage	EV Charging hub in city centre car park
Code		61		63	63	G4	G5

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investment requirement of £1.5M (2 M€). Additional work will be done to engage private car park owners regarding deployment on their sites.	Based upon the success of this project, Glasgow intends to fund the replacement of all 70,000 street lights within its estate using intelligent LED street lighting columns with integration into the Central Management System. This will require investment in excess of £100M (135 M€), which will be funded by the Council. There will be approximately 300 within the project area. There will be a further 3,200 that will be intelligent across the city centre (funded through ERDF/City Deal), which will complement those in the project area. The deployment of EV chargers on street lighting in other parts of the city will be informed by the outcomes of the RUGGEDISED project. The Central Management System will be procured through ERDF/City Deal. H2020 will fund the demand-management system, that will aggregate and control multiple controllable loads across the project area (street lighting, EV chargers, domestic/non-domestic buildings, etc).		The creation of a DBDP will be an open system for other developments in the city to access. The platform upon which the tool is built is already at city scale so little further investment will be required.	It is the ambition of Glasgow City Council to ensure all 70,000 street lights are controllable and can be deployed in a demand side management application. The city centre already has planned investment of $c.f3M$ (4 ME) from the European Regional Development Fund and the Council has profiled the spend required to upgrade all its lighting infrastructure in the coming decade, the programme for which has commenced with 10,000 fights due to be replaced in all major arterial routes. The aim of Glasgow City Council is to have replaced 10,000 by the end of financial year 2016/17. Note that this is the replacement of traditional lighting with LEDs. Once deployed, it is the Council's intention to make them intelligent also, through a centrally-procured Central Management System will allow city-wide deployment of intelligent street lighting.	It is the ambition of the Wheatley Group to see deployment of the DSM technology in domestic properties across the city if the <i>Smart Corridor</i> demonstration proves successful Those with local generation, such as PV, will be the initial targets for deployment.
	∞		~		თ
funded by H2020	This is both technical challenge and business case related. The integration of EV charging into the street lighting column will be funded by TS and the street lighting will be funded through European Regional Development funding. The H2020 funding will be used to develop the intelligence that allows communication of data generated to be used to examine the demand-side management potential of connected EV assets and street lights themselves. The business case challenge will be to understand how the owners of connected EV assets will be remunerated in the event of power being drawn from their battery upon the occurrence of a demand- side event.	ENERGY MANAGEMENT AND ICI	Creation of a query based geo-spatial 'Data Based Decision Platform' (DBDP) that will collect data related to city management (e.g. energy, air quality, traffic flow, etc) and provide analysis of multiple data sets to enhance energy planning in the city. GCC will utilise existing Open Data Platform and build DBDP around existing ICT infrastructure. This is a technical challenge.	The challenge with this solution is a technical one to examine how intelligent LED street lighting can be used in a demand-side management context to be part of a 'smart grid'. Examining how the central management system can control the lighting in a demand-side event. In addition it will explore the potential for also controlling connected assets, such as EV's.	The challenge is in developing the GCC central Management system to integrate domestic properties into a 'smart grid', thus allowing demand- side management events to be triggered that benefit both the grid and the residents. This will require the deployment of technology as well as intelligence to ensure that a full understanding of the potential of demand- side management is understood in a domestic scenario. This will include exploring the potential to activate cheaper tariffs for residents when
	0 0		ecc	SIE / GCC	sie / wg
	Intelligent LED street lights with integrated EV charging functionality, wireless communications network, and air pollution monitors		Smart open data Decision Platform/central management system	Implementation of demand-side management technology in street lighting	Implementation of demand-side management technology in domestic properties
	<u>6</u> 6		G7	8 9	69

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	renewable generation exceeds demand. The impact of local storage will also be analysed.	
.0 Implementation of SIE demand-side management technology in non- domestic properties	E/GCC The challenge with this solution is a technical one to examine how non- domestic buildings can be used in a demand-side management context to be part of a 'smart grid'. Examining how the central management system can control the buildings in a demand-side event.	The Council has already explored demand side management at a lower TRL in a fraction of its non-domestic stock (10 properties). This project i an evolution of that initial work at a higher TRL. Therefore, successful integration with the central management system will lead to integration of more of GCC's stock in the future (GCC's estate exceeds 800 properti
.0 implementation of one demand-side management technology in non- domestic properties	Evolution from the chainenge with this solution is a technical one to examine now non- domestic buildings can be used in a demand-side management context to be part of a 'smart grid'. Examining how the central management system can control the buildings in a demand-side event.	TRL in a fraction of its non-domestic stock (1 TRL in a fraction of its non-domestic stock (1 an evolution of that initial work at a higher T integration with the central management sys of more of GCC's stock in the future (GCC's e

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The following text highlights the main contents of the replication plans prepared by the follower cities. More information are provided in the annex A to this proposal. These plans will be thoroughly developed and deepened during the five years of the project life and, in particular, information on budget and funding sources indicated in the tables could change during the course of the project as they might be further supplemented by more in depth analyses and sources today still not available.

1.4.4 Follower City Brno

Brno (378,000 inhabitants) is the secondlargest city in the Czech Republic and a centre of the South Moravian Region. It has a strategic geographic position within Central Europe with excellent transport accessibility, including an international airport. Brno has a borderline oceanic climate and a humid continental climate with cold winters and hot to warm summers.



Brno smart city vision

The Smart City Brno Concept was approved by Brno City Council in October 2015. The main motto is that Brno is "a city which cleverly, sensibly and effectively uses modern technology and approaches leading to an improvement in quality of life, supporting an effective governance, preserving natural resources and energy sustainability". The scope of the smart city vision is extremely broad and touches all areas of the city of Brno.

The basic principles that should lead to a wider and long-term cooperation between the city and its partners in particular are:

- Openness the city should be open to ideas, stimuli and solutions and through a transparent and effective use of its data enable new solutions, applications, impetuses to business as well as the creation of new jobs and services.
- Responsibility to develop the city in such a way that future generations will experience a high quality of life, functioning services and a high degree of security and order in the city.
- Modularity the city ecosystem will allow the city to develop optimal and reasonable technological solutions that do not lead to dependence on suppliers. It also allows removing services (applications, modules, technology) that no longer fulfil the needs of the city's users by replacing them with new and more effective solutions.
- **Thoughtfulness** towards the city's inhabitants and the environment –to govern the city in a way that the development does not have a negative impact on the environment (quality of life in the city), and where it is unavoidable, there is compensation for the negative impacts of development.
- Effectiveness city should see its development as an opportunity for using solutions which have potential of job creation and economic development. At the same time it should be efficient and thrifty in its administration (low operational energy consumption and running costs). Part of this will be innovative business models allowing primarily for the engagement of SMEs including start-ups, for which the city is creating a supportive environment.
- Diversity in its development the city should supports diversity of solutions to enable citizens chose an optimal solution from their perspective. City should thus improve the accessibility to the various part of the city by reducing and simplifying the travel routes for the interested audience and thus saving time and energy demand.
- **Cleverness** the city should make effective use of the potential knowledge at its disposal and find ways to make use of it in both long term development and in its everyday business. Not only centres of excellence in science but also promising start-ups can be utilised by the city as its "laboratory" to develop its reference ecosystem.



Replication and Investment Plan Brno

Replication Area

There are three main replication areas:

- Brno Exhibition Centre offers more than 130,000 sq m of net exhibition area thus ranking among the world largest exhibition centres. Brno Exhibition Centre first opened in 1928 commemorating the first decennium of independent Czechoslovakia founded in 1918. Brno as a location for the new exhibition centre was chosen on purpose being conveniently situated between Prague and Bratislava.
- "Jižní Centrum" The southern portion of the centre of Brno is a unique locality that has long remained a
 marginal suburban zone. Its formation was the result of the unplanned interweaving of rail lines and the
 initial growth and later decline of industrial production over the past 150 years. This prominent and complex
 brownfield, an area open for development, is now slowly being transformed thanks the development of
 individual entrepreneurial and building activities.
- "Lužánky" large area of sports and leisure time infrastructure. In last decades of 20th century there were three important symbols of Brno's sport infrastructure: Swimming pool, old football stadium and ice-hockey stadium in very bad shape. Furthermore a hotel, commercial activities and others leisure time activities were added in 90's. Nowadays the area has a great development potential.

A portfolio of brownfields should serve for demonstration of any inspiring lighthouse solution. Brno has some 378 ha of underutilised or neglected sites mostly left over from the transformation process after 1989. The preferred localities for the further development of business activities, housing and other city functions are these brownfield sites, which can often offer an attractive location in an already built-up area connected to existing technical infrastructure.

<u>Brno</u> replicated smart solutions	LH- Smart Solutions	Description	Estimated Cost, Funding Source, Scheme and Funding Timeline availability
B1	R11, G6	Smart street lighting : In the "Jižní centrum" southern centre part of Brno, a new system of public lighting will be realized, including LED technology with light regulation, integrated EV charging, wireless communication network, transport and environmental sensors.	 710 000 € City budget, private, PPP, EU, city companies 2021
В2	R1-4, G1, U1-4	Thermal grid and energy storage: In the "Lužánky" sport and leisure time area and large trade-fairs area, "Veletrhy Brno", thermal grid and waste heating storage facilities will be implemented	 180 000 € City budget, private, PPP, EU, city companies 2021
В3	R1-4, G1, U1-4	City heating network lower temperation grid: in the broader city centre the heating infrastructure will be reconstructed into lower temperation grid.	 1 790 000 € City budget, private, PPP, EU, city companies 2021
В4	R5, G4	Photovoltaics: Integration of RES in the electric smart grid in "Veletrhy Brno" trade fairs, public buildings.	 710 000 € City budget, private, PPP, EU, city companies 2021
B5	R5, G4, G5, U6	E-mobility charging infrastructure : In "Veletrhy Brno" trade fair area parking house building will use RES and battery storage for E-charging hub for all mode of e-mobility working as grid balancing mechanism.	 1 070 000 € City budget, private, PPP, EU, city companies 2021
B6	R8-13, G7- 10, U8-9	Energy management : infrastructure for smart metering will be set in public buildings, connected into dynamic system based on open platform to promote energy efficiency behaviour.	 290 000 € City budget, private, PPP, EU, city companies 2021

Smart Solutions

Β7	R3	Smart waste management: Cooperation between waste management city owned company and transport management company. Set up sensors in containers to monitor filling of containers and developing new dynamic models for optimization of waste transport routes.	-	70 000 € City budget, private, PPP, EU, city companies 2021
B8	R9, G7, U8	Visualisation 3D operational city model: Visualisation of all kind of available data (mobility, energy, waste, water, etc) in 3D model supports decision making process, promoting RES and energy efficiency behaviour and alternative mobility solution.	- -	40 000 € City budget, private, PPP, EU, city companies 2021
B9	R9, G7, U8	Smart Open Data city Decision platform: Open Data city Decision platform empowers not only city decision making process. Also helps new businesses, start-up community, research, application market, creates new employment in new industries.	- - -	40 000 € City budget, private, PPP, EU, city companies 2021
B10	U7	Energy-efficient land use policy : Through flexible green parking pay off - New building and development policy for land use will be set to helps sustainable mobility, energy savings and prevents CO2 pollutions.	-	70 000 € City budget, private, PPP, EU, city companies 2021

1.4.5 Follower City Parma

Parma (192,000 inhabitants) is located in the Emilia-Romagna region, halfway between Milan and Bologna. Because of its continental climate, seasons are moderate; the average temperature in January is 0.9°C and in August it is 24°C.



Parma smart city vision

Parma's smart city vision is to accelerate the city's sustainability and innovation. This vision is outlined in the documents "Balance on the first half of the term of office" (Bilancio di metà mandato), "Programme of the term of office" and in the "Single Programming Documents" (SPD) which identifies the policies, the strategies and the planning guidelines to be implemented, recognises their possible medium and long term impacts and takes into account the regulatory framework and the objectives of the public budgetary policy. All these documents, officially approved, are available in the city website (www.comune.parma.it).

The following Replication and Investment Plan is coherent with these objectives, especially those relevant to the sustainable city. To implement its vision, Parma signed the Covenant of Mayors (2013) and the Mayors Adapt Initiative (2014). The SEAP was adopted in 2014, in 2015 it was ranked the best Italian SEAP (A+COM, Italian Climate Alliance), the SUMP is under preparation and will be completed by the end of 2016 together with various actions to increase modal split. The City has a zero waste strategy and in 2015 the new energy regulation of the city has been issued to increase energy efficiency and the use of RES. The new policy and plan for urban planning and regeneration protects and promote the city's environmental integrity and cultural identity, and finally, the City participates to EU funded projects to increase its knowledge and expertise on innovation.

Thanks to the ground-breaking activities that RUGGEDISED will set in motion, Parma expects to be a model replicator and an inspirational example for other Italian and European mid-size cities. By working with the other partners of the project, Parma will bring about a decisive change in the behaviour of citizens, in view of a more conscious and smart use of energy and mobility. This will be attained by integrating the knowledge and the experience gained in RUGGEDISED with a number of other local and European projects whose common goal is to aggregate citizens and stakeholders around the notion that sustainability is indeed a collective commodity. Lastly, in times of severely shrinking public budgets, Parma's ambition is to use RUGGEDISED as a springboard to build stronger links and cooperation with both local and international stakeholders from the research and industrial world, in order to trigger investments in the local economy, consolidate markets and boost

SCC-1-2016 - Smart Cities and Communities lighthouse proj Associated with document Ref. Ares(2016)5910251 - 13/10/2016

employment.

Replication and Investment Plan Parma <u>Replication Area</u>

The Parma University Campus is the scientific centre of the University of Parma. It covers an area of about 77 hectares located in the south of the city, with several buildings for teaching and scientific research.

The heated volume is about 300.000 m^3 and every day more than 7.000 people live, study and work there.

The Campus energy consumptions are mainly due to building heating and cooling, domestic hot water, indoor and outdoor lighting. All buildings are currently served by a district heating/cooling system, which is connected to a thermal power plant (based on methane gas boilers) and to cooling machines for air conditioning.



Smart Solutions

The RUGGEDISED smart solutions that the City of Parma will adopt aim at creating a smart district with an integrated management of energy efficiency, sustainable mobility and ICT. The package of smart solutions has been selected to meet the ambition of Parma to become a smart city in a few years. The guiding principles in setting this package have been: the feasibility of the solutions in the local context of Parma, the up-scaling potential of solutions in other city districts and the integration of the solutions to overcome the usual sectorial approach. The replication plan will enhance the integration between energy efficiency, renewable energies, energy storage, monitoring consumptions, sustainable mobility and data flows. The solutions can be connected to existing or already planned projects and integrated into the city's existing plans and in plans that are being revised or prepared (SEAP, SUMP, Mastercampus etc.), which will support their sustainability.

<u>Parma</u> replicated Smart Solutions	Link to Lighthouse Smart Solutions	Description	Estimated Cost, Funding Source, Scheme and Funding Timeline availability
P1	R1-4 G1 U3	New CHCP plant for district heating connection: New plants for distributed energy generation will be implemented in the thermal power station serving the district heating and cooling of the University Campus: in order to optimize heating loads, a thermal storage will be also implemented.	1,500,000 €; Public, Private, PP, ERDF; 2019
Ρ2	R8-13	Energy management system: Energy demand and supply information of buildings will be provided by using smart meters and the BIM-model. These data in energy flows together with the introduction of the energy management system will ensure an efficient energy-exchange between the assets.	150,000 € Public, Private, PP, ERDF 2019
Ρ3	G4	Solar PV and supply of energy to EV charging and battery infrastructure: Surplus electric energy from PV systems will serve storage batteries to EV chargers. 700 kWp of PV panels are being installed. It is considered a battery with electric storage equal to 2000 kWh.	1,000,000 € Public, Private, PP, ERDF 2019
Ρ4	U9	Intelligent building control: Intelligent control system for the internal climate to be installed in buildings: a continuous monitoring system allowing the optimization of the indoor climate depending on the weather and uses, and then reducing energy consumptions. To incentivize users to save energy, digital real-time information, statistics on climate impact and suggestions to put the homes in "saving mode" will be showed to the end users.	250,000 € Public, Private, PP, ERDF 2019
P5	R7	E-Mobility Planning Software: The project involves the implementation	150,000€

		and renewal of two obsolete night services management software called "Prontobus" (a bus service 'on demand') and the school bus service called "Happy Bus". Information about traffic and mobility will be collected in order to optimize the service. Expected results are increase of users to 60.000 (Prontobus) and 1600 (Happy Bus). Foreseen integration with the general software of the local public transport system and the future replacements of conventional vehicles with 'zero emission vehicles'. Foreseen integration with the general software of the local transport system and the future replacements of vehicles with 'zero emission vehicles'	Public, Private, PP, ERDF 2020
P6	G5	E-Charging Hubs – E-vehicle charging infrastructures: Realization of additional hubs for E-vehicle charging suitable for car sharing, bike sharing, electric cars, electric bikes powered by RES. These E-charging hubs will be super-fast and placed at special spots, developing the business case for concentrated deployment of EV chargers, connecting the charging hubs to RES and battery storage.	500,000 € Public, Private, PP, ERDF 2021
Ρ7	R8	Smart Waste Management: Monitoring system of the filling degree and collection vehicles' route optimization. This solution will be applied on the collection of the glass banks in the Campus and in the nearby district (80 glass banks) as a pilot phase; if the results are good, it is expected to be extended to the whole city (1.300 glass banks).	30,000 € (pilot); 380,000 € (scale-up) Private, EU funds 2021
Ρ8	R9, G7, U8	Creation of a query based geo-spatial 'Data Based Decision Platform': An integrated system of data monitoring and analysis will be assembled and configured from multiple systems and environmental and energy monitoring devices. The system will produce multiple analyses and "accommodate" all modelling calculations, and will provide users with a decision support tool for environment and energy planning and control. The system will be set up so that it can be used for future developments of different types of data, and it can integrate new functional modules of the mobility-environment system of Parma.	83,000 € Private, Public 2021
Р9	R9, G7, U8	Smart Open Data city Decision platform The solution will complement P8, by integrating collected data from other areas such as buildings, mobile devices and other "objects" that communicate with the territory. It will implement the Open Portal and App that will allow users to access data and to use them in an integrated way.	65,000 € Private, Public 2021
P10	G6, R11	Smart public lighting : The refurbishment of the public lighting city network will be implemented in the next years, public procurement is in progress. Target for this action is to improve the efficiency of the street lighting system in order to reduce consumptions of at least 60%, and to change 75% of the public street lighting lamps with LED systems, with configuration for installation in the future of intelligent sensors to adjust lighting intensities, to measure air pollutions, with a centralized management system. The challenge is to make the system smart and develop the necessary intelligence and integration. There is also a challenge for the development of a business model for the participation and financing of private.	1,000,000 € Public, Private 2022

Beyond the replication of the smart solutions described above, Parma is going to implement, during the fiveyears period of the project, many other relevant solutions which are preliminary to the development of the Replication Plan. These solutions involve: Intelligent public lighting, refurbishment of building blocks; expansion of the district heating network as well as the setting up a revolving funds for refurbishment of private buildings, development of SUMP and empowerment of electric mobility. SCC-1-2016 - Smart Cities and Communities lighthouse proj Associated with document Ref. Ares(2016)5910251 - 13/10/2016

1.4.6 Follower City Gdansk

Gdańsk (460,000 inhabitants) is a Polish city on the Baltic coast, the capital of the Pomeranian Voivodeship (province in north-central Poland). It is the Poland's principal seaport and the centre of the country's fourth-largest metropolitan area. Gdańsk has a temperate climate, with cold, cloudy, moderate winters and mild summers with frequent showers and thunderstorms.



Gdansk smart cities vision

"Gdańsk 2030 Plus Development Strategy" is a document, which outlines the vision of Gdansk growth and progress by 2030. The top priorities defined in the strategy, using participatory methods, are: inhabitants, learning, cooperation, mobility, and openness. The strategy defines 5 major development areas: Education and Social capital; Economy and Transport; Public space; Culture and Health. The overview of Gdansk's Strategy is available on the web.⁸ On December 17th, 2015 the City Council has adopted the resolution that defines 8 operational programmes (up to 2023) to implement the strategy. The programmes are: education, Public health and sport, Social inclusion and Active citizenship, Culture and Leisure, Innovation and Entrepreneurship, Investment attractiveness, Infrastructure, Mobility and Transport, and Public space. In addition, Gdansk has adopted a **Low-Carbon Economy Plan** (PGN) in December 2015 and is currently undergoing **SEAP** certification by the Covenant of Mayors. The city has been involved in **ACCUS** (ARTEMIS-IA/FP7) research and development project to provide smart city operating system to integrate and coordinate urban distributed systems.

Gdansk is also a role-model city when it comes to implementation of open-data standards. In last quarter of 2014 **"City of Gdansk Manifesto of Openness"** was proclaimed. Gdansk representatives declared that the city would continuously open municipal and public data resources for citizens and industry in order to provide access to data gathered, processed, and stored with the use of public funding.

Replication and Investment Plan Gdansk

Replication Area

Gdańsk Śródmieście ("Downtown") district is the traditional area of Gdansk, where the old town is located. The quarter covers 5.65 km² and is populated by 29,630 inhabitants which gives population density of approximately 5244 persons per square kilometre.



Smart Solutions

The smart solutions will be deployed on the ground of replication plans elaborated in the RUGGEDISED project. Their role is to offer activities complementary to building insulation, thermo-modernization, heat-network connection, which will offer innovative edge to the typical construction/refurbishment investments. All smart solutions (replication projects) are indicated in either the 7th Operational Programme (*Infrastructure*) or 8th Operational Programme (*Transport and Mobility*). Both programmes have been officially adopted by the City Council on December 17th, 2015 with the resolution no. XVII/514/15.

<u>Gdansk</u> replicated smart solutions	Link to Lighthouse Smart solutions	Description	Estimated Cost & Funding Source-Scheme-Timeline
GDA1	R8, R10	RES-ready urban energy management system (GDA1): Deployment of RES-ready solution that enables (a) energy consumption monitoring and profiling; (b) cost control; (c) controlling of RES energy production and its effectiveness, (d) integration of CPSs (cyber-physical systems), telemetry, and	Considering two options: (A) system will be purchased in PPP model; (B) project will be funded by Gdansk municipal funds, EU funds

⁸ <u>http://www.gdansk.pl/urzad/plik,58379.html</u> (English version).

		telematics. System provides monitoring features with regard to RES-energy production and storage.	2019+
GDA2	R5, G4, U1	Advanced energy management and integration system for public school building : Refurbishment and modernization of a public school building, including BEMS, deployment of RES, energy- storage, energy-grid integration, ICT platform to integrate CPSs in the energy domain.	0.8 M€ Interreg Baltic Sea Region 2014-2020 (photovoltaics), public-private partnership (EDF, Schneider-Electric), Integrated Territorial Investments (ZIT = 60%), own investment (Gdansk) up to 2021 (refurbishment); beyond 2021 (ICT, integration, RES)
GDA3	R5, U1, U4, G4	Refurbishment, modernization, and ICT for buildings in Lastadia street: Deployment of smart building technologies, including an energy management system and building automation; integration with RES, energy-storage and energy-grid integration.	10 M€ Integrated Territorial Investments (ZIT) and Gdansk Drainage (GDMEL) up to 2020 (refurbishment and construction); beyond 2021 (ICT, integration, RES)
GDA4	R2, R4	Sewage-heat recovery for bicycle-path defrosting: Deployment of sewer-heat recovery solutions (distributed sewer collectors and heat recovery technology) that will be used for bicycle-path thawing during winter season.	Gdansk Water and Sewers Infrastructure (GIWK), EU funding 2020+
GDA5	U6, G5	EV charging points: Deployment of 10 FEV recharging points, including ICT integration and deployment of RES with complementary energy-storage. Recharging points will be integrated with street lighting.	investment in planning 2020+
GDA6	R9, G7	Geographic Information System for heat, electricity, and water network : Implementation of GIS technology for heat, electricity, and water networks together with decision-support and planning tools	4–5 M€ investment in planning 2020+
GDA7	U8	Open data standards for energy consumption monitoring in public buildings : Exposure of public energy related data-sets with the use of ACCUS platform as a gateway to integrate energy systems and provide data to CKAN open-data platform.	Investment in planning 2020+

Beyond the replication of the smart solutions described above, Gdansk is going to implement, during the fiveyears period of the project, many other relevant solutions which are preliminary to the development of the Replication Plan. These solutions involve: smart integration (ACCUS) and open data (CKAN) platforms, applications for traffic monitoring and intelligent transportation systems, application for better use of city's resources (garbage collections, etc.), development of new bike facilities, etc.

Section 2 Impact

2 Impact

2.1 Expected Impact

The lighthouse and follower cities share the common goals: to improve the the quality of life of the citizens, to reducing the environmental impacts of activities, and to create a stimulating environment for sustainable economic development.

RUGGEDISED project will make an important contribution to these goals by introducing innovative, efficient, replicable, scalable and integrated solutions for smart cities and communities. The expected impacts of the project, as specified in the call for proposal for the Smart Cities and Communities lighthouse projects are presented in the sections 2.1.1 to 2.1.4 together with the justification how RUGGEDISED respond to them.

2.1.1 Expected impacts of the lighthouse cities as listed in the call: SCC-1-2016

In this section it is explained how RUGGEDISED will achieve the overall expected impacts as listed in the call topic, including the ambition to go beyond.

Put in practice a solution for a challenge identified by the city

One of the main challenges in the sustainable development of smart cities is to increase the overall energy efficiency in the entire energy chain, and to operate the whole energy system more holistically and optimally. This includes increasing the efficiency of thermal and electrical energy via district renovations that are planned by the lighthouse cities, as well as enhancing the use of renewable and low carbon energy sources.

In more detail, the challenges of the lighthouse cities are:

- 1. To provide cost efficient and sustainable energy infrastructures for a low carbon city / peak load management;
- 2. To develop appropriate cooperation structures and business models to allow for energy efficient smart solutions by exchange of energy between end-users, prosumers, etc.;
- 3. To develop Smart City (open) data platforms / city 3D model / energy management systems.

The key solution in all three lighthouse cities of RUGGEDISED is to arrange successful combinations of integrated smart solutions for energy and e-mobility (enabled by ICT platforms and open data protocols) and appropriate business models with the right incentives for stakeholders to invest and participate in a smart carbon-neutral society. In order for this to be realised, all involved actors will investigate business structures and financing as part of the project and for each smart solution. A large number of new business models will be developed (some of them are deliverables). This work has to be done and will show their value only during the project when the required data has been collected, analysed and used for integration and lessions learnt.

Section 1.4 describes in detail the ambition and practical solutions of each lighthouse city, including how the follower cities will cooperate from the start of the project. The work packages 2, 3 and 4 provide detailed descriptions about the development of the planned solutions in the lighthouse cities: Rotterdam, Umeå and Glasgow. In Work package 7, the activities of the follower cities how to achieve - in the future - similar expected impacts as the lighthouse cities are described.

The outcomes of the RUGGEDISED project have direct benefits for more than 200 thousand citizens from a total of 1.3 million residents in the cities. In fact, the whole population will be positive affected by the improvement on the sustainability of the different cities and the improvement of air quality.

The implementation of the solutions in the cities will trigger a large amount of investments from public and private entities in the consortium, notably in the construction, energy, mobility and ICT sectors. It is estimated that the implementation of the project mobilizes investments of about 1 billion EUR. This will have a significant impact, not only on the local economy but also on national and European level. These investments will create jobs. Based on results of a study from EuroACE in 2012⁹ it is expected that already the investment in energy

⁹ See 4 How Many Jobs? A Survey of the Employment Effects of Investment in Energy Efficiency of Buildings by EuroACE

efficiency improvements of the buildings and related infrastructure will result in a total of >1,900 new jobs, with the investments in the other sectors this number will be increased further.

2.1.2 Energy related impacts

In this section, the main energy related impacts are presented.

Increase the energy efficiency on district level at least

The lighthouse cities will increase the energy efficiency on district level through wide-scale energy efficient renovation of buildings, smartening of buildings, smart use of heat (exchange/storage) between buildings, smart energy management and utilising the potential of low carbon ICT systems. The energy efficiency will be increased by 20 to 60% depending on the specific case. In each case, relevant stakeholders (owners, prosumers, *etc.*) will be involved. In the BEST summary tables below, the expected energy efficiency increase per building in terms of the reduced energy demand is presented for each lighthouse city.

The lighthouse cities will increase the energy efficiency on district level through wide-scale energy efficient renovation of buildings, smartening of buildings, smart use of heat (exchange/storage) between buildings, smart energy management and utilising the potential of low carbon ICT systems. The energy efficiency will be increased by 20 to 60% depending on the specific case. In each case, relevant stakeholders (owners, prosumers, *etc.*) will be involved. In the BEST summary tables below, the expected energy efficiency increase per building in terms of the reduced energy demand is presented for the lighthouse cities of Rotterdam and Umeå.

Notter dam						
BEST-summary	Total area	Energy demand	Energy supply			
100 zero energy residential buildings	13,000 m ²	-18%	Electricity			
Art building	13,300 m ²	-25%	District heating (natural gas)			
Exhibition centre	23,364 m ²	-29%	District heating (natural gas)			
International congress centre	29,200 m ²	-23%	District heating (natural gas)			
Swimming pool	14,000 m ²	-34%	District heating (natural gas)			
Total:	92,864 m ²	-25%				

Rotterdam

Umeå

onica			
BEST-summary	Total area	Energy demand	Energy supply
Hospital	15,945 m²	-61%	Geothermal strg. / district heating (waste, biofuels, HP, <5% fossil fuel)
Building with student apartments	6,000 m ²	-50%	District heating (waste, biofuels, HP, <5% fossil fuel)
University building with laboratory	14,650 m ²	-23%	District heating (waste, biofuels, HP, <5% fossil fuel)
Total:	36,595 m²	-44%	

Based on CBS¹⁰ data, an average utility building consumes 115 kWh electrical energy and 20 m³ natural gas per square meter, the total expected savings for the 92,900 m² of buildings in Rotterdam, the 36,600 m² of buildings in Umea are 4.5 GWh electricity per year and 0.8 million m³ natural gas per year.

Regarding the lighthouse city of **Glasgow**, a large plan on demand side management activities will be tested to identify and demonstrate the key aspects of this technology in a total area of > 52,000 m² of buildings. As an outcome from this activity it is expected a demand reduction of 5% to a total of 0.3 GWh savings per year. However, a larger impact on reduction of greenhouse emission and a benefit to the stability of the local network are expected from the load shifting at different times of the day.

in 2012 based on research of Rod Janssen and Dan Staniaszek.

¹⁰ Statistics Netherlands (<u>http://www.cbs.nl/en-GB/menu/organisatie/default.htm</u>) is responsible for collecting and processing data in order to publish statistics to be used in practice, by policymakers and for scientific research.

In terms of CO₂ emission reduction, the total expected savings for the cumulative 182,000 m² of buildings in the three lighthouse cities is 3.7 Mton CO₂ per year based on conversion factors of 0.46 kg CO₂ per kWh electricity and 1.8 kg CO₂ per 1 m³ natural gas.

Increase significantly the share of renewable energies and their integration into the energy system On the energy supply side, the lighthouse cities are investing in generation and/or enrichment of the energy network by renewable energy sources.

In the case of Rotterdam, the smart solutions are: a) PV cells on roof tops of buildings to heat water stored in boilers to pump into the district heating network, b) PV cells for electricity generation, to be used or stored in the district (in batteries or electric vehicles), c) Enriching the heating network by waste-water or transporting heat-surplus from industries, and d) Pavement or surface water heat/cold collectors to balance the heat-cold peaks in the network.

The large buildings in the Heart of South of Rotterdam give excellent opportunities for PV and urban wind. The amount of PV added is huge. All suitable roofs will be used for PV. On the various buildings more than 12,000 m^2 of PV will be realized with a total maximum capacity of 2 MW. With the production of 1.8 million kWh more than 850 tons of CO₂ will be reduced. For peak shaving on the energy supply side, the combination of solar and wind is a good solution: they are largely complimentary to each other.100 urban wind turbines will be realized on the Congress centre Ahoy which will produce 150,000 kWh and reduce 72 tons of CO₂. A part of the PV is reserved for charging the battery storage off grid via a DC cable for the fast charging point for electric busses, a solution to raise the efficiency and to reduce the peaks on the energy demand side. Additional proposed solutions are: enriching the heating network by waste-water or transporting heat-surplus from industries, and pavement or surface water heat/cold collectors to balance the heat-cold peaks in the network.

In the case of Umeå, the actions on the supply side include geothermal technologies to reduce the hospitals need for district cooling and heating through the use of 125 holes of 200 meters deep. The total amount of energy used from the geothermal storage is 5,000 MWh. Taking into account the emission factor for district heating in Umeå, this means 210 tons of CO_2 eq / year. Further, the connection of the District Heating in Umeå is produced from about 30% waste, 60 % biofuels, >5% from heat pumps and <5% from fossil fuels, which improves significantly the reduction on the greenhouse emission. The low number on CO_2 reduction for Umeå comes from the fact that the Swedish energy mix has 20 times lower greenhouse emission than the EU mix.

For Glasgow, the increase in RES comes from roof mounted solar PV canopies and optimisation of the use of the electricity from urban wind turbines, connection to the battery storage utilising an innovative system of netting off generation against consumption in assets owned by GCC, e.g. netting off the power generated by the turbines against the consumption of the car park, via the battery, thus freeing up potential placements for the turbines. Further, the connection of the buildings involved in the project to the District Heating is not directly translated into reduction in demand, but carbon emissions savings. For instance by enriching the heating network by heat-surplus from industries (like for example the TCB in Glasgow) to housing companies (like WG). There will be consumption reduction through demand-side management, with an overall of 5% reduction and a load shift such that consumption will happen at different time of the day to benefit the local network.

In the table below the relevant details for the cities of Rotterdam, Umea and Glasgow in terms of RES increase and related CO_2 reduction are shown.

RES Impacts	Rotterdam	Umeå	Glasgow	Total
Energy supply				
RES Increase [MWh]	4,255	78	337	4,670
CO ₂ Reduction [tCO _{2eq} /yr]	1,442	285	2,113	3,840

Make the local energy system more secure, more stable and cheaper for the citizens and public authorities

The demonstrated solutions will provide contribution to the future stability of the energy infrastructure in the three cities. While there are currently no problems with the electric distribution system, a large scale roll-out of

electric vehicles and PV could lead to this. The implementation of demand-side management technologies will result in a better alignment of productions and consumption peaks with a positive effect on the power quality (potential prevention of blackouts and decrease of voltage and frequency levels). In a first step, these measures to reduce peak heat mostly prevent the use of peak heat boilers resulting in lower costs and carbon emissions by reducing the need for fossil fuel peak power plants. This also holds for the envisioned energy storage that will reduce the use of the most expensive – both with respect to costs as CO_2 emissions - production units during peak demand hours. These management tools will be supported by appropriate planning tools, already allowing judging the effect of PV on the grid before possible implementations, further increasing grid stability.

The RUGGEDISED project also have a significant impact over the energy cost for citizens. As it was stated previously, one of the aims of the project is to fight against energy poverty. In the city of Glasgow this will be approached with a reduction of 400 to $600 \notin$ /year per average household in the lighthouse districts of Glasgow and Rotterdam, respectively.

2.1.3 Mobility related impacts

The mobility sector, as a pillar of the smart city, is one of the focuses of the RUGGEDISED project. The lighthouse cities have made a strong commitment towards smart e-mobility solutions and smart public transport. The share of electric vehicles is on the rise in Europe. Following the Clean Power for Transport Package and the associated Alternative Fuels Directive (2014/94/EU), cities in Europe are striving for a transition towards non-fossil fuelled mobility towards 2050¹¹. With a rising share of electric vehicles in cities, the demand for electricity will change significantly. Estimates made by ECN (Dutch Energy Centre) show that an average household would likely double its electricity demand if a full electric vehicle would be added to the household¹² (3,000 kWh/year based on 15,000 km; average electricity use of a Dutch household is also approximately 3,000 kWh/year).

According to AVERE¹³ (European Association for Electric Vehicles) we have exceeded 1 million (plug-in or full) electric vehicles in September 2015, an increase of 50% compared to 2014. In countries like the Netherlands 1:10 newly sold vehicles is equipped with a power-plug. In addition, the total costs of ownership of electric vehicles are dropping, which is mainly caused by lowered costs of batteries. All in all we can conclude that the market of electric vehicles is lifting off and that this will have a serious impact on the demand for electricity in the years ahead.

The main challenge regarding mobility is to change the business as usual, with a large share of trips within the cities based on petrol and diesel vehicles and a large impact on quality of life, air pollution, noise and climate change. The impact over the mobility sector has to provide affordable and sustainable mobility services at local level. Therefore, the package of solutions foreseen in the RUGGEDISED project includes a broad range of new e-mobility services and charge stations. These developments will mean a complete set of new business models.

The lighthouse cities Rotterdam, Umea and Glasgow are preparing themselves for this future in RUGGEDISED with the impacts listed below.

Ensure the roll-out of electric vehicles in cities while containing the need for excessive upgrading of the electricity grid

The integration of a large number of new electrical consumers (the electrical vehicles) in cities is a great challenge in the lighthouse cities. For this purpose, the city of Glasgow planned a supply of RES to EV charging and battery infrastructure in Duke Street to minimize the amount of energy that is being fed back into the local electricity grid and an offer of smart street lighting / charging facilities in the district with an appropriate business model to buy and sell electricity through and from the grid. Additionally, the EV Charging Hub will have a dedicated connection to the electrical network to provide grid balancing services. The exact nature of this connection will be decided during the project. It is likely to be via Current Transformers (CTs) that will allow the Grid Interface Controller to know the status of the network and use the battery storage to inject or absorb

¹¹ <u>http://ec.europa.eu/transport/themes/urban/cpt/index_en.htm</u>

¹² www.energie-nederland.nl/.../EnergieTrends2014.pdf

¹³ www.avere.org

electricity to/from the electrical network to rectify any grid imbalances that may result from the increased penetration of CHPs, EV Charging & renewable technologies in the Smart Corridor District.

In this sense, additional 25 two-way charging points for electric cars will be installed in the Heart of South in Rotterdam, which will make RES-storage as well as the use of this energy possible depending on the actual daily demand (to cope peak load variations). These parts of the electric grid will be optimized by making a connection of the (e-bus) charging stations to a smart direct current (DC) grid powered by RES.

Apart from the solutions that will be implemented to cope with peak load variation in the electricity grid, WP6 will support the up-scaled deployment of solutions by assessing the long-term scaling potential and energy system effects (see task 6.4).

Reduce transport based CO₂ emissions, on the basis of CO₂ intensity of the European electricity grid of 540 g CO₂/kWh (coherent with TEST format)

The challenge and innovation is to introduce zero emission buses successfully on a large scale, starting with 6 and aiming at 40 buses in the coming years, while at the same time the reliability of the timetables of the public transport at all situations and at all times has to be guaranteed. The reliability of the needed ICT planning software has to be 100% and has to be tested and developed in real time to experience the large effects on the logistic operations. For reaching the optimal result, including the exploration of city distributions, actual simulation models of the Erasmus University Rotterdam will be used as well. In the next five years approximately 250 conventional buses will be replaced by zero-emission buses in the entire city of Rotterdam.

During RUGGEDISED, 33 electric buses will start servicing the area and the city of Umeå, with 3 new hubs the first year of the project. The city of Umeå is aiming to upscale the solution to 8 new hubs during 4 years. UE are investing in 40 new charging points and VCC are investing in 2 super charging points.

The addition of both the integration of new electric vehicles to replace ordinary vehicles with combustion engines and the deployment of high efficient recharging/ refuelling units to power existing electric vehicles for the three cities will have an overall impact of greenhouse emission reduction above 1,800 tons of CO_2 eq/yr. This overall saving of emissions is calculated by applying a CO_2 conversion factor of 460g/kWh. The lighthouse cities foresee powering some of the 80 new charging stations and 11 (large) e-hubs, 100% on renewable electricity, thus the CO_2 saving effect in reality is considerably higher. These stations are planned to power the electric vehicles integrated in the project as well as the existing vehicles previous to the project to increase the impact of the intervention.

In the case of Glasgow, it is not planned an integration of new electric vehicles. The improvements on mobility will be reached by a deployment of 15 new charging stations. The large number of electric vehicles in the city has to be understood as number of charges within a year, although these over 11,000 chargers per year will be done by a lower number of electric vehicles.

Mobility impacts	Rotterdam	Umeå	Glasgow	Total
Savings				
CO ₂ reduction [tCO _{2eq} /yr]	150	1,631	78	1859
E-mobility				
Number of charging stations	25 stations + 1 large e-hub	40 stations + 10 large e-hub	15 stations	80 + 11 e-hubs

Improve local air quality

As it is stated before, a special focus is dedicated to air quality since it is a common issue in the Lighthouse Cities involved in the present project. Air quality has turned to be of great importance due to the significant increment of illnesses reported by inhabitants of large cities, with new syndromes as the sick building syndrome (SBS) as well as allergies or lung problems. These symptoms are related to contaminants presence on air, such as NOx or SO₂, due to the extensive use of fossil fuel vehicles among other factors.

Nowadays, it is rather low the number of project that properly integrate the approaches to increase air quality and energy efficiency with a suitable integration of ICT, being often the domains of different communities working independently. In the RUGGEDISED project, it will be developed a coupled analysis of energy and air quality on a district scale, with a clear commitment on sustainable urban mobility.

In the table below the relevant details for the cities of Rotterdam, Umea and Glasgow in terms of reduction of sulphur dioxide, nitrogen oxide and particulate matter (PM_{10}) are shown.

Impact on the local air quality	Rotterdam	Umeå	Glasgow	Total
Sulfur dioxide reduction [kg SO ₂ /yr]	435	375	18	828
Nitrogen oxides reduction [kg NO _x /yr]	1,420	1,223	58	2,701
PM ₁₀ reduction [kg/yr]	226	195	10	431

The relative low number of impact on the local air quality for the lighthouse city Glasgow is due to the fact that it is not planned an integration of new electric vehicles in this city, but a deployment of 15 new charging stations to ensure the roll-out of electric vehicles in cities while containing the need for excessive upgrading of the electricity grid.

In this sense, the large number of electric vehicles in the city has to be understood as number of charges within a year, although these over 11,000 chargers per year will be done by a lower number of electric vehicles.

***** Reduce technical and financial risks to enable large scale replication

The reduction of the technical and financial risks can be ensured by the availability of business models that make the implementation of innovative solutions more transparent and risks visible so that measures can be taken to avoid these. A wide range of business models will be developed during the implementation of the project. The demonstration will allow for test environment for business model development. The involvement of investors and relevant stakeholders will ensure that their experience and concerns are considered. At the same time the requirements of the involved stakeholders for data availability will be screened to see which information should be available so that future investments are seen as transparent from their point of view. Activities to reach this will include visualisation of potentials, development of payment system or business models for thermal energy trading.

Low carbon ICT system related impacts

One of the major goals of RUGGEDISED is also to create an open ICT data-service-ecosystem. This is to prevent a vendor-lock in which would slow down the transition into a smart city technically, economically as well as socially. Open system will lead to a further local added value, as local SME can use the data and their knowledge of the local population to develop services for the population and the local government. On the other hand the underlying platform is more easily replicated in other cities, as they again can encourage or contract local SME to provide solutions for their local needs. Therefore RUGGEDISED will prove the openness of the ecosystems developed by aiming at a number of open solution to be integrated. As multiple solutions are there from the start of the eco systems developed, the attractiveness for SME will be high enough that the cities plans to engage them are fruitful

The work done in the framework of RUGGEDISED will produce up to 24 open solutions, providing at least 14 applications to interoperate with third parties. Regarding the integration of ICT systems, it is foreseen to reach 22 integrated systems.

Technological integration	Rotterdam	Umeå	Glasgow	Total
Open solutions	3	6	15	24
Interoperability 3 rd party applications	-	4	10	14
Integrated ICT systems	8	7	7	22

In the city of Umeå, an intelligent building control will be developed as an app for the tenants to log in/out when leaving the apartment in order to reduce energy use from heating and ventilation. A discount will be received

by those using the app in order to enhance the use.

The city of Glasgow will develop a complex Central Management System that will be used for Glasgow's Intelligent Street Lighting infrastructure. This system will not only control the lights in the city, but will also control other smart nodes – domestic/non-domestic buildings, EV chargers, etc – as well as transmit data from smart nodes & sensors back to the demand-side management controller and open data platform.

It should be noted that the primary means of interconnecting the smart nodes to the Central Management System will be via the wireless network that will be mounted on Intelligent Street Lighting infrastructure. This network will ultimately be rolled out across the whole city as we deploy more Intelligent Street Lights. This will be an open protocol that will allow myriad smart nodes to be connected and controlled via the Central Management System. For this purposes, the project will develop 4 APIs.

Additionally, the EV Charging Hub will have a dedicated connection to the electrical network to provide grid balancing services. The exact nature of this connection will be decided during the project. It is likely to be via Current Transformers (CTs) that will allow the Grid Interface Controller to know the status of the network and use the battery storage to inject or absorb electricity to/from the electrical network to rectify any grid imbalances that may result from the increased penetration of CHPs, EV Charging & renewable technologies in the *Smart Street* district.

Create stronger links and active cooperation between cities in a large number of member states with different sizes, geography, climate zones and economic situation.

The RUGGEDISED consortium consists of three main groups of cities that are cooperating. The first group is formed by the three lighthouse cities Rotterdam, Umea and Glasgow that are intensively cooperating on the development of appropriate solutions for the defined challenges. A second group of cities is formed by Brno, Gdansk and Parma, that is closely following the activities in the lighthouse cities and that will apply their gained knowledge for the implementation of the replication plans. Thirdly, around the lighthouse and follower cities around 20 cities will participate in the so-called Cities Interest Group. The CIG-cities will actively be involved in the transfer of experiences, do's and don'ts regarding smart city development. The CIG member cities will be selected by partner ICLEI as part of the dissemination and communication activities. Two cities from outside Europe have already committed themselves to RUGGEDISED; Portland in USA and Mumbai in India.

The cooperating cities show a very good representation of 'cities in Europe', in terms of size (120,000 – 700,000 inhabitants representing 90% of EU cities), geographic spread (West – Glasgow; North – Umea; South – Parma; East – Brno), climate zones (Umea versus Parma; Glasgow & Rotterdam versus Brno) and economic situation (Czech Republic, Poland, Scotland, Italy, Sweden, the Netherlands).

Mumbai is exceptional in terms of size, economic situation and cultural difference compared to Europe, nevertheless Indian cities are developing themselves to become smart cities stimulated by the Indian Ministry of Urban Development (<u>http://smartcities.gov.in/</u>). Mumbai has expressed its interest to learn from Europe and especially the RUGGEDISED cities in this respect. The other exception is Portland that according to USA standards can be regarded as one of the most straightforward cities in terms of energy efficiency, spatial development and mobility & city planning.

2.1.4 Activities of the follower cities to achieve the expected impacts as listed in the call

The follower cities Brno, Parma and Gdansk have presented their detailed replication plans in section 1.4. Each city has its own challenges, planned solutions and implementation path. The replication activities are described in WP 7 and in detail in the Replication plans.

The target impacts of the follower cities (Brno, Gdansk and Parma) relate to the objectives set out by the work plan of WP7, which is in charge of the replication efforts of RUGGEDISED. As shown in the table below the 3 follower cities seek to pave the way for smart solutions replication through:

- The improvement of the level of cooperation among the relevant stakeholders taking part in the local smart city projects. This is indicators is measured in terms of number of meetings of the local governing groups and the number of estimated participants to each meeting (number of involved stakeholders,

already identified, times the number of attending individuals). All three cities have already running forms of governance that will be enhanced in RUGGEDISED through knowledge exchange of local practice and adoption of co-creation approaches. Accordingly, the 3 follower cities estimate an improvement of the level of satisfaction with the local cooperative processes. This indicator is a local expert estimation measured as an increase percentage over the 2016 baseline.

- The improvement of the level of capacity necessary to effectively replicate the selected smart solutions after the end of the project. This dimension is assessed through the delivery of a number of key planning documents (the Smart City Vision, the Roadmap to Implementation, and the Replication and investment Plan) as well as the acquisition of organisational and technical competence transferred from the lighthouse cities and necessary for the actual smart solutions deployment. Capacity improvement is a local expert estimation measured as an increase percentage over the 2016 baseline.

Link	Objectives	Outcomes (effect indicator)	Outputs (activity indicator)
Improvem ent of the cooperatio n	Create physical and virtual environments for stakeholder and community	Local smart city cooperation (institutions, utilities, industries, businesses, civil society)	 3 running and permanent local Governing Groups 10 local Governing Groups meetings each attended by 40 individual participants in Brno 13 local Governing Groups meetings each attended by 12 individual participants in Gdansk 15 local Governing Groups meetings each attended by 40 individual participants in Parma
	interaction and involvement in the follower cities		 Overall satisfaction with the level of local cooperation (calculated in % improvement over 2016 baseline). o Brno: 30% o Gdansk: 20% o Parma: 30%
	Define the vision and the path to smart solutions replication	Long-term and tactic planning	 Adoption of 1 strategic Vision and 1 Roadmap to implementation in Brno Adoption of 1 strategic Vision and 1 Roadmap to implementation in Gdansk Adoption of 1 strategic Vision and 1 Roadmap to implementation in Parma
	Acquire the necessary competences to replicate the	Local and inter- project capacity building	 6 Replication Workshops, each attended by 4 experts in Brno, 4 in Gdansk, and 4 in Parma
			 6 Governance Workshops, each attended by 20 individual participants in Brno, 20 individual participants in Gdansk, and 50 individual participants in Parma
Improvem ent of the capacity			- 3 intensive Study Tours, each attended by 4 experts from Brno, 4 from Gdansk and 4 from Parma
54945.00			 1 international Study Tour attended by 4 experts from Brno, 4 from Gdansk and 4 from Parma
			 Overall perception of improved smart city capacity thanks to project activities (calculated in % improvement over 2016 baseline): o Brno: 20% o Gdansk: 20% o Parma: 40%
	Deliver Replication and Investment Plans	Detailed planning of smart solutions replication	 Adoption of 1 Replication and Investment Plan in Brno Adoption of 1 Replication and Investment Plan in Gdansk Adoption of 1 Replication and Investment Plan in Parma

2.1.5 Improving of innovation capacity and the integration of new knowledge, strengthening the competitiveness and growth of companies

How RUGGEDISED contributes to improving the innovation capacity, the integration of new knowledge, strengthening the competitiveness and growth of the involved companies can best be explained via the Implementation Concept (see Figure 2.1). It is basically adequate integration of technologies that exist already or are very near-to-market (\geq TRL-7) in energy and e-mobility with ICT systems and appropriate business and governance models.

The innovation lies in the advanced combination of smart technical solutions and adequate business models. During the implementation phase, **knowhow** is generated about <u>how to</u> <u>achieve integrated smart solutions for the</u> <u>challenges in the lighthouse cities, how to arrange</u> <u>solid cooperation between stakeholders, how to</u> <u>arrange sound societal involvement and how to</u> <u>achieve exploitation of opportunities</u>.



This **cumulative knowhow** will be used for the **upscaled deployment** of solutions by the cities and local (industrial) partners in the consortium,

Figure 2-1 Implementation Concept (same figure as figure 1.3)

resulting in flourishing market and business development. Consequently, this leads to the growth of the involved companies, strengthening of the competitiveness and increase of employment. The follower cities and other European cities will pick up the cumulative knowhow about the integrated smart solutions, and how to arrange solid cooperation between stakeholders, sound societal involvement and exploitation of opportunities. These cities will create partnerships comprising local partners and relevant partners from RUGGEDISED, e.g. R&D partners for advice and guidance and industrial partners for providing specific technologies, solutions and/or services. Subsequently, the integrated smart solutions will be implemented in the follower cities (**Replication**).

RUGGEDISED's smart solutions (32 integrated ICT-Mobility-Energy (energy sources and energy efficiency) solutions and their added value are described in detail in section 1.4 and the approach to innovation is described in detail in section 2.2.

2.1.6 Contribution to environmental and social impacts

RUGGEDISED contributes directly to the following environmental impacts:

- RUGGEDISED deploys wide-scale, innovative, and integrated smart solutions in the fields of energy, emobility and ICT, resulting in a reduced energy consumption of 4.5 GWh per year, and greenhouse gas emission savings between 3.7 Mton CO₂ (see section 2.1.1);
- Sustainable mobility solutions: E.g. in RUGGEDISED RET will deploy truly operate green bus lines in an urban environment. Knowledge will be acquired among others about charging infrastructure in the city, and its integration to the smart grid. Public transport will be significantly decarbonised in the lighthouse cities. Additional benefits are that the buses are more quiet, which increases the comfortability of urban environment. In Rotterdam, the new terminal with new environmental friendly buses might also attract more young people to work at RET;
- Air quality will be improved in the lighthouse cities due to increasing of efficiency of mobility and replacing of fossil transportation fuels by an electrical vehicle fleet, where charging is optimized with smart grid integration.

RUGGEDISED contributes directly to the following socially important impacts by:

- Increasing local employment and quality of life by strong inclusion of local people to the project, and assures a maximum transfer of knowledge to local people via employing them in the project. These skills and knowledge becomes valuable also after the RUGGEDISED, when cities continue to develop the

sustainability of their other areas. The actual job creation will come through direct deployment and business in the lighthouse projects, for which in total 1,900 of new jobs are expected;

- Increasing citizens' feeling of security, among others via improved street lighting, and more pleasant living environment after renovations;
- Offering more opportunities for citizens to participate to urban regeneration, and is engaging citizens in
 positive change towards energetically sustainable city. Citizens are better informed about real time status
 of city's systems and they have better access to new services that and support good quality of living, while
 also increasing citizens' awareness of low carbon impacts and acceptance of related activities;
- Sustainable mobility improvements and integrated urban planning also have a positive impact on health and well-being through enabling walking and cycling as important means of transport coherently integrated into internal multimodal transport system;
- Improving the accessibility in the areas at risk of social exclusion of citizens by providing cost efficient mobility solutions;
- Increasing the transparency of the public transport system management by the open data approach.

2.1.7 Barriers and obstacles that may affect the achievement of the expected impacts

Barriers and obstacles that may affect the achievement of the objectives and expected impacts, are:

- Consumers lacking awareness and knowledge about smart solutions, the added value thereof and their own social responsibility in this respect. It is necessary adequately inform people in order to create awareness and social responsibility, leading to behavioural change. Further, some citizens might mistrust data and systems under development. As an example, there can be resistance from the building tenants to increase the automation control, when they are afraid of losing control or of losing the individual power of choice. Related to this challenge, it is crucial that citizens and other end-users are involved in the project activities, and they can also have better access to information among others via the city activities (e.g. via WP2, 3 and 4);
- Developers and buyers can have conservative attitudes, which cause reluctance to accept and introduce new technologies, e.g. when renovating buildings energy sources from gas and electricity to hybrid and renewable energy sources. Additional related barriers can be that recommendations developed during the project are not taken into account by decision makers. These barriers can be overcome with open and active dialog among the different stakeholders in the Implementation of the smart solutions itself, as well as sharing of information about good practices and lessons learned from similar activities in other lighthouse cities (WP 2, 3 and 4) or from other Smart City Projects (WP 8), and showing the real benefits of example lighthouse projects;
- Interoperability among different systems can cause problems, especially if relevant standardization is lacking, or the ICT standards are too slowly deployed and harmonized (too many "vendor-locked solutions in the markets). Although interoperable data exchange and system operation can be solved locally, the replication of interoperable and integrated smart solutions can be a challenge. This issue will be addressed in WP1: Setting the Innovation Framework for Energy, Mobility and ICT and in WP6: Transition Framework. Furthermore, data security and privacy questions will be addressed. For example, privacy issues might be a barrier when measuring the detailed energy consumption which might, as well, indicate user activities;
- **Partial optimization**, e.g. when the overall benefits are not optimal due to strict focus on a specific issue. This could result from technical constraints of chosen systems, but also from regulatory aspects. This lowers incentives and may lead to prohibiting the implementation of solutions with net societal benefit. This barrier can be overcome with open and active dialog among the all the different stakeholders including regulatory bodies and policy-makers. Further, the sharing of information about good practices and lessons learned from similar activities in (the) other lighthouse cities (WP 2, 3 and 4) or from other Smart City Projects (WP 8) could be helpful to provide practical ideas for avoiding or solving sub-optimal solutions and/or settings;
- Slow adoption of new business models and of new contractual models between the involved stakeholders, including the adoption of performance-requirements during the procurement stage. These barriers will be addressed by WP1 and especially WP 6 and WP 7, as these WPs aim to ensure the wide scale replication;
- Uncertainties about co-funding of the investments related to upscaled deployment plans. To be able to make adequate decisions about investment, thorough knowledge is needed about additional investment

costs and uncertainties in operational costs. RUGGEDISED contributes to avoiding of this barrier via extensive performance monitoring, measuring and assessment of impact of the implemented smart solutions in the lighthouse cities (WP5).

2.2 Measures to maximise impact

2.2.1 Strategy and implementation measures

The project results are 32 integrated ICT-Mobility-Energy (energy sources and energy efficiency) solutions (**smart solutions**). The RUGGEDISED project follows a strategy of implementation of these smart solution in three lighthouse cities, mapping and validation of those solutions, transition to upscaled deployment and delivering of new business, financing and governance models, as well as replication, including EU replication. Communication and dissemination are a prominent part of the strategy too, as explained below.

The implementation of the strategy follows 4 phases (see Figure 2-2). The implementation of the smart solutions and a data collection/mapping as well as partial analysis and validation of these will take place in Phase 1; upscaled deployment of smart city solutions will be carried out in phase 2; replication activities will be carried out in phase 3 and the dissemination and communication activities in phase 3 and 4. The plans for upscaled deployment, replication and dissemination - explained under approach to innovation (2.2.2) and Dissemination Plan (2.2.3) – detail the approach to implement the RUGGEDISED strategy.





Phase 1: PREPARE & IMPLEMENT (M1-58): Learning from the past to build the future

Building on the experiences from previous Lighthouse City projects, an overarching innovation and implementation framework tailored towards each of the lighthouse cities Rotterdam, Umeå and Glasgow will be set up as part of WP 1 (month 1-4) and WP6. The Implementation phase follows in month 4-36, and is defined as the implementation of 32 smart solutions that fall within the scope of SCC1-2016/2017 in the light house districts. This phase assures a coordinated approach on how to solve implementation issues and transfer knowledge from all the Lighthouse cities. This phase will be active until all measures are implemented, max. until the end of year 3. All implementation partners will deliver data from demonstrated solutions which will be monitored in the monitoring sub-phase which last more than 2 years.

The Lighthouse implementation WP's (WP 2-4) exchange knowledge via the Liaison group set up. Each Lighthouse city is foreseen to have max. 7 local (industrial and non-industrial) partners prepared to deliver the smart solutions and the development and testing of new business, financing and governance models that allow for quick replication at scale.

The collected data from the implemented smart solutions will be the basis for WP monitoring (WP5) which coordinates the monitoring methods, data gathering formats and evaluation criteria of the data to be collected.

The analysis begins in month 19 and ends no later than month 48. Validation also includes evaluation includes market obstacles encountered during the implementation – as a basis for work in WP 6, 7 and 8.

This framework is designed to identify the strengths, weakness, opportunities and threats for each city and the capabilities and roles of the wider ecosystem of city stakeholders. As such, the framework will ensure a coordinated approach towards implementation with mechanisms built in (e.g. Innovation platforms) to effectively engage and feedback learning with key stakeholders through the Liaison Group, partnerships, consultation or workshops across council departments.

This framework will set out the parameters outlining overall short term (particularly related to energy efficiency) and long term value to both civil and political aspirations, which will be evaluated too.

Phase 2: CHECK AND ASSESS (M19-48): evaluation for the development of sustainable business models

The objective of the WP Enabling upscaled deployment and business model innovation (WP6) is to generate knowledge and capacity for the Lighthouse cities to be able to accommodate an upscaled deployment of their Smart Solutions implemented in WPs 2-4 in the wider city. **Upscaled deployment** is defined as (post-project) implementation of smart solutions by local partners in wider lighthouse city areas and elsewhere.

Implementing Smart City measures in a district will be a great effort but will likely not affect the energy balance or modal share of the transport system for the whole city or city-region. In order to upscale the Smart City measures, analyses of societal developments, the energy system, financing solutions and governance models are necessary. This phase aims to provide this knowledge to the Lighthouse cities. WP 6 will benefit from the output generated both in the technical implementation in the demonstration WPs but also from the collaborative work performed in WP1 and take the conclusion on how to maximise output from the existing Smart City solutions, to a wider city wide context, discussing at the same time solutions and knowhow available with the follower cities and the city interest group. WP 6 sets out an ambitious goal to initiate Innovation platforms in the Lighthouse cities, which will be an institutionalisation of the integrated planning and collaboration between stakeholders in the Lighthouse Cities to foster further smart city innovation. Again, these will function as exemplars to other cities willing to become smarter.

A key output will be Smart City Implementation Packages containing all information necessary to allow for replication in a wider community of EU-cities.

Phase 3: REPLICATION (M36-M60): building sustainable cities and districts

The RUGGEDISED project is now ready to start the replication phase. While WP replication will of course start early on in the project, it has a peak of activities in month 36-60 when the implementation and validation is concluded, so within the final two years of the project.

The Follower Cities Brno, Gdansk, and Parma will benefit from WP replication activities. The first aim of replication activities will be to implement the successful integrated smart city solutions in this group of cities. This will be subject to the local requirements and regulations. The Follower Cities belong to the core group benefitting from experiences and successful implementation of demonstration activities within the Lighthouse Cities. Forth, the City Interest Group will be a wider community of interest within the RUGGEDISED project. They will participate in dedicated events from the project and get direct knowledge-transfer from both Lighthouse Cities and Follower Cities. However, the City Interest Group will not get direct support from the project in implementing smart city solutions and individual products, services and methodologies derived from project results.

Phase 4- SHARED LEARNING (M52-60): from demonstration sites to a European reality

Other **networks and market actors** will benefit from the measures to maximise impacts as well. They encompass actors reached via different networks, such as the Enterprise Europe Network (EEN), the ICLEI network, Polis, Eurocities, the Covenant of Mayors, C40 and the Green Building Council. Furthermore, other cities and private companies as well as other businesses will have access to smart city solutions and products, services and methodologies of RUGGEDISED via market mechanisms.

EU Replication is defined as the (post-project) implementation of lighthouse-inspired approaches and smart solutions in other EU cities. Once the *RUGGEDISED* project has successfully implemented and validated the smart solutions and created business plans, smart solutions can further be rolled out in in other European cities too.

Exploiting a range of dissemination channels including ICLEI's extensive city network, Covenant of Mayors, the EIP Platform, Covenant Capacity and the SCIS, the project will not only seek to raise the profile of the cities involved in the project, but in working closely with the experts involved in the other EC funded Smart city projects of Horizon2020.

Figure 2-3 shows an overview of the RUGGEDISED impact and market uptake. The actions to maximise impact will be arranged along a cascade with growing impact and growing market uptake. The longer the project lasts, the higher the expected range of implementation within the Lighthouse and Follower Cities and the higher the chances for the validation under real market conditions.



Business Models Products, Services, Methodologies

Figure 2-3 Overview of RUGGEDISED Impact and Market Uptake

During the project proposal phase, deployment plans and a plan for the dissemination and communication of the projects' results were developed. These documents will be updated throughout the project. They will lay the ground for the exploitation of results as well as the dissemination and communication strategy. The following sections explain in detail the main steps for the execution of these plans.

2.2.2 Approach to innovation – (upscaled) deployment and replication

The RUGGEDISED project will use a proven approach based on comprehensive tools that guide the development of deployment and replication strategies while ensuring all actions and plans contribute to the overall strategy of the project. The approach consists of the following elements, building on 1) A Deployment plan for each smart city solution, 2) A Replication plan for each follower city and 3) A Smart City Business Model Approach.

Deployment Plans

To maximize impact, Deployment and Investment Plans have been written by Rotterdam, Umeå and Glasgow. They define a strategy to deploy the concepts and solutions beyond the life of the project. All Lighthouse Cities have developed a specific deployment plan for each smart solution that will be updated and adapted to the activities carried out in the project. The key to the success of the upscaled deployment of the smart solutions will be attractive, validated results and viable business models. Next to that the available skills, knowledge, and experiences (*See section 3.3 - Consortium as a whole*) and the European-wide multi-sectorial industrial networks of all RUGGEDISED consortium partners contribute directly to the upscaled deployment.

In addition evidence based project results are attractive to the three follower cities who have committed themselves already, as well as other communities, and their citizens, firms, etc.;

Deployment Plans will be updated and scaled up in the lighthouse WP's (WP2-4), which will define a strategy to explore the potential of the smart solutions beyond the life of the project. The key to the success of this will be:

- utilizing the urban innovation platforms within the RUGGEDISED project; the success of Smart Cities lies as much in the possibility to transform urban development towards an inclusive process, as in the deployment of technical components and systems. The demonstration measures implemented in WPs 2-4 will only be possible to carry out in a partnership between several stakeholders and actors in the Lighthouse cities. In order to scale up the business models established to govern the technical demonstration projects, a close collaboration structure between relevant actors in the Umeå, Glasgow and Rotterdam needs to be established.
- in the Smart City Business Model development which will identify possible benefits, risks and challenges that are related to upscaling (extending the scope of use cases from that of the piloting phase). Task 6.2 will shed light on profitable business models and opportunities at different scales as well as synergies that result from operating multiple different technical solutions within a single city and ecosystem setting both specific and generic limitations to the upscaling. This process needs to be iterative and feed back to task 6.1 where actors involved in Smart City innovations are gathered. Conclusions from the liaison groups in T1.3 on the validity of the used business models will be taken into account in order to adapt the methodology for business model generation. The collection of financing models for the smart solutions in WP1 will be analysed and synthesised to create an overall Smart City Business Model Approach, which is applicable to different environmental and organisational characteristics and that can be used in novel business generation for Lighthouse Cities as well as follower cities.

Replication Plans

Replication activities are crucial to create impact beyond the lighthouse demonstration projects and create conditions for the wider market up-scaling of the developed solutions.

The Replication activities, designed to foster the direct exploitation of the solutions demonstrated within the project timeframe, centre on the strong group of Follower Cities within the project consortium. The cities of Brno, Gdansk and Parma are all firmly committed to the future replication of the measures being demonstrated within the Lighthouse Cities.

WP Replication aims to guide and support Brno, Gdansk and Parma (the follower cities) in getting ready for smart solutions replication by the end of the project. This 5 years long empowerment path seeks to fulfil the following steps in each city:

- Participate in an intensive process of capacity building and knowledge transfer, together with the other follower cities and with the lighthouse cities, in order to enable the following path:
- Assess the state of play and establish a smart city-governing group to steer the local replication efforts.
- Deploy a participatory foresight process to assist in developing a long-term Smart City Vision and a Roadmap for deployment of the vision.
- Deliver a Replication Plan of smart solutions, to tangibly roll out the implementation of the vision.

WP Replication deploys a structured capacity building programme (that constitutes the backbone of the WP Replication), coupled with continuing knowledge sharing with the other WPs to enrich the empowerment process. The effectiveness of the knowledge transfer and training programme executed by WP Replication is going to be monitored through the preparation and distribution, by ISINNOVA, of regular surveys in which the follower cities will progressively assess the process of developing and strengthening the skills, abilities, processes and resources needed to reach the stage of becoming lighthouse cities themselves. Surveys will be organised (and distributed), as follows:

- At the beginning of the project to the staff involved in WP7 in Brno, Gdansk and Parma. The results will establish a reference baseline presented in D7.7 Initial Replication Assessments and passed on to WP5 for future evaluation.
- After each Replication Workshop and Local Governance Workshop.
- After each local Governing Group meeting.
- After each Study Tour.

The analysis of the surveys will allow the project to assess how (much and how well) the empowerment of WP7 has served the replication process in Brno, Gdansk and Parma.

These measures will be complemented by the establishment of a wider **City Interest Group** of 20 additional cities, with a commitment to replicate and developing further replication plans during the lifetime of the project (WP9).

The outcome of these activities should be the initiation of the first replications of the demonstrated solutions. To increase impact the project will also develop Smart City Implementation Packages containing all information necessary to allow for replication in a wider community of EU-cities. The Follower Cities will be guided through the process by ISINNOVA and ICLEI. ICLEI will provide expert support for activities such as the City Interest Group, and make appropriate links with WP9 Communication. The final objective is to start the replication process itself within the final two years of the project.

An overview of RUGGEDISED' anticipated major innovations and their added value to partners is provided in Table 2-1 below.

Exploitable knowledge (description)	Exploitable product(s) or measure(s)	Sector(s) of application	Main partners involved
Conclusions and recommendations on future measures based on the energy systems analyses for each Lighthouse city (WP6) Conclusions on set up and management of Innovation Platforms (WP1, WP6) Business model generation processes for Smart Solutions (WP6)		Energy, mobility and infrastructures	SP, Rotterdam, Umeå, Glasgow, TNO, AIT, Strathclyde, Swedish ICT, ISINNOVA, EUR
Capacity to elicit and steer stakeholders participation in order to enhance the effectiveness and ownership of smart solutions implementation (WP7)	Permanent city Governing Groups to support the design and the implementation of the Replication and Investment Plan	City governance	ISINNOVA, Brno, Gdansk, Parma, GIWK, Pictec, InfoMobility,
Capacity to use participatory foresight methodologies in public policy making (WP7)	N/A	Public policy co- creation	ISINNOVA, Brno, Gdansk, Parma, GIWK, Pictec, InfoMobility
Capacity to design, procure for and implement advanced physical network (electricity and heat) and energy storage systems to effectively integrate energy supply and demand (WP7)	Smart grids and district heating measures integrating RES and traditional energy sources aiming at optimize, also through energy storage systems, the building and electric mobility demand in Brno, Gdansk and Parma.	Energy production and energy consumption in the residential, service and transport sectors	ISINNOVA, Brno, Gdansk, Parma, GIWK, Pictec, InfoMobility
Capacity to design, procure for and manage advanced ICT systems and information platforms (WP7)	Implementation of open source and georeferenced data systems to monitor, map and manage the city resources (heat, electricity and water) and the city services (transport, waste collection and management)	Residential, service and transport sectors	ISINNOVA, Brno, Gdansk, Parma, GIWK, Pictec, InfoMobility

 Table 2-1
 overview of RUGGEDISED' anticipated major innovations and their added value

2.2.3 Dissemination Plan

This dissemination & communication plan describes how the RUGGEDISED project will communicate its activities and results to the outside world, and will be completed in the first six months of the project. In addition to a situation analysis and the communication objectives, the strategy describes the WHO (target groups), the WHAT (key messages tailored to each audience) and the HOW (the tactics and the timeline according to which these will be implemented).

Target Groups

Cities: National - in the same country as RUGGEDISED cities, City interest group, European Cities. Specific stakeholders in this group would be <u>policy makers and energy practitioners</u>.

Business: industry partners, affiliated organisations and start-ups.

Citizens: end-users directly impacted by the project, the city-wide community

Press/Journals: specialised media related to cities, energy, ICT, smart technology

The dissemination & communication strategy of the RUGGEDISED project aims at directly involving these four target groups through all its steps as a supporting measure for the project itself – in order to continuously feed back to all relevant parties concerned. Under WP9, ICLEI will run the Communication and Dissemination Secretariat which is designed to ensure effective communication and dissemination on local, regional, country and EU-level to provide maximum exposure of the project. ICLEI sets the direction through the development implementation the and of communications strategy.

Besides the traditional communication tools and channels for reaching the target audience, also innovative plans for making use of the internet and



Figure 2-4 Communication channels

related social media will be developed. A comprehensive social media strategy can make the communication of RUGGEDISED more effective in two ways:

- Firstly, social media enhances traditional communication tools as it can help to connect to online communities in which important stakeholders are active. As well as this, the project can start its own online community, in which important stakeholders can get information and are able to contribute to the ambitions of RUGGEDISED.
- Secondly, social media have an increasing influence on the public opinion regarding new technologies. An active social media policy can help both with positively influencing public opinion, by promoting the merits of RUGGEDISED to society via the fast and wide infrastructure, and with identifying and countering online initiatives aimed at reducing the public acceptance of the new technologies promoted by RUGGEDISED.

In Table 2-2 a matrix is given of the planned deployment of both traditional and more modern communication tools per target group and purpose.

Tactic group#1 Raising awareness	Tactic group#2 Sharing information	Tactic group#3 Exchange & engage				
	Audience: Cities					
Project website : City profiles outlining the solutions with regular updates and relevant sign-up forms to help manage and plan city-to-city study tours in the Lighthouse Cities.	Presentations will be shared in platforms such as slideshare.com respecting the levels of privacy (presentations are going to be public or private according to the topic and information provided).	Study visits: Lighthouse visits demonstration sites will set up local study visit programmes that will be adapted and marketed to selected target groups, covering				

Table 2-2 Target audience
Promotional brochure/business cards to	Blog updates: Blog-style updates	specific aspects of the project.		
be produced to promote the project and	documenting the project progress will be	European workshops: will be		
its activities to a wide audience via	the responsibility of the Lighthouse	hosted by the project cities either		
relevant events and mailings.	cities. Content will be focused on the	in their home countries or in		
Blog: updates documenting the project	implementation of the 12 solutions and	tandem with larger scale events.		
progress will be written as blog posts by	the lessons learnt.	The aim is to enable interaction		
the Lighthouse cities. Content will be	Technical & thematic factsheets to be	and peer-to-peer exchange with		
focused on the implementation of the 32	produced that focus on particular	city counterparts		
solutions and the lessons learnt.	aspects of the smart cities approach.	External third-party events:		
E-update to be published three times per	Replication package: will be developed	Members of the project		
year providing short updates on	on the activities implemented in each of	consortium will attend events that		
Lighthouse City implementation measures,	the Lighthouse Cities – these will focus	are relevant to the topic and		
as well as any relevant updates from	on what was done, how it was done,	through which target groups can		
Follower Cities.	what was achieved, what was the	be reached.		
Social media: in the form of Twitter &	financial impact, and what is the			
targeted Linkedin Groups will serve as a	replication potential.			
micro-blogging platform where updates on	Results Brochure In the final year of the			
project progress can be shared.	project a will be developed presenting			
A suite of videos (Vlog): giving an	summarised results from the three			
overview of the project and interviews	Lighthouse Cities, with a focus on			
with key city stakeholders e.g. mayor, chief	presenting "good reasons for going			
information officer, energy managers.	smart" and "success stories".			
:	anas Rusinas (distributors start uns			
Audi	ence: Business / distributors, start-ups			
Smart solutions on website: featuring	Remote product demos: are	Study visits: will provide an		
information on the product and the	recommended tools for business	opportunity for industry partners		
contact person, as well as a sign-up form	partners to develop.	to share their products with		
from potential distributors or other cities	Testimonials: at the end of the project	interested parties to support		
interested in their product.	industry partners can collect testimonials	deployment and wider		
Local webpages: partners delivering the	from the Lighthouse cities to support	exploitation.		
smart solutions will set up a page on their	their product profiling.	Network partners with		
organisations website (if it does not	Factsheets: the technical factsheets	distributors: Registrations of		
already exist) profiling the specific smart	described above will be delivered by the	interest in the products will be		
solution that they are delivering.	business partners responsible for specific	compiled and forwarded to the		
	solutions.	relevant industrial partner.		
Audience: Citizens				
Local website, run by the city and linked to	Manned showrooms: showing the	Comments platform:		
the project website provides regular	different innovations and how to make	Hackathons: organised locally		
updates the developments in the area and	best use of them	Focus groups /consultations:		
the impact it	Information points: contact person for			
Virtual visits: via animated video will be	the districts that are being refurbished	with volunteers to strengthen the		
used to publish promotional	to be on hand to answer any questions	community and support the		
Social media: a Facebook page, twitter	and provide a face to the project.	transition to a smart, sustainable		
account and Flickr account will be set up to	Citizen reporter: gives the opportunities	city e.g. to train elderly persons in		
share the latest updates in the local	to local citizens to tell the story from	the use of computers and social		
language.	their perspective.	media		
Local Newsletter: The newsletter is going	Schools: smart cities day initiative could			
to link to all social media channels and	take place in the local schools for			
inform about the recent news related with	students who visit the demonstration			
the project.	site and engage with the smart solutions.			
	Audience: Press			
Press releases/articles on key project	Press corner on project website:	Invite to key events: e.g. the EU		
milestones and outputs in targeted	featuring a press pack, links to photos,	workshops which are being		
publications (for cities, policy makers and	past articles and media contact for the	organised under WP8/9.		

energy officers) at a European and national level.	project.	
Establish relationships with the local		
press: to run feature report on the local TV/radio station, and press articles.		

Roles and responsibilities

Effective communication comes from a joint effort across the board; all partners are therefore expected to be actively involved in contributing to communication activities. Specific involvement in tasks is outlined in WP9.

2.2.4 Management of Knowledge and Intellectual Property

Data Management Plan

The achievement of RUGGEDISED goals in terms of expected impact can be enhanced by an open data management plan which will aim to communicate and spread knowledge of project results to policy makers, scientific communities, and to any stakeholder that will be benefit by the project results. RUGGEDISED finds great potential in sharing project results in a digital repository, participating in this way to the Open Research Data Pilot of H2020, based on the dissemination level of project results. First, project data availability and sharing will raise the impact of RUGGEDISED coordination and support activities, allowing for access to an unprecedented number of potential users. However, dissemination of certain project results will be directed only to public entities and/or official EU bodies across Europe **based on the dissemination level**.

An open data management plan will also generate wider interest towards improvements achieved by the project in order to facilitate and potentiate exploitation opportunities. To this end, RUGGEDISED capitalizes on the development of a well-defined Data Management Plan (DMP), including:

- Data Types, Formats, Standards and Capture Methods
- Ethics and Intellectual Property
- Access, Data Sharing and Reuse
- Resourcing
- Deposit and Long-Term Preservation
- Short-Term Storage and Data Management

DMP will comply with the EC DMP template¹⁴ and will specify how the generated data will be easily discovered, preferably via **DOI**, and accessed, ensuring **open access** by adopting the adequate licensing scheme (e.g. Creative Commons License). Moreover, DMP will describe **quality evaluating tools/procedures**, which will prove the data intelligibility. DMP will also define the type of **accompanying information** in the form of metadata or short description to allow potential users to gain awareness on the data concepts and evaluate their suitability for future use. Escorting information will also include acknowledgement to the EC funding of the RUGGEDISED project, along with any information required to maximize the dissemination of the EU support. Last but not least, DMP will specify that **standard formats** will be used to facilitate the adoption and successful operation of open research data, whenever this is applicable. All data generated and collected throughout the duration of the project can be categorized into the following main types:

- Data sets generated based on the work conducted within RUGGEDISED.
- Collection of data based on the RUGGEDISED Workshop results.
- Collection of data based on the RUGGEDISED linking activities with other SCC projects.

All the aforementioned data will be open and stored in an open (RUGGEDISED) repository, in order to be accessible in a wider community based on the classification level. Moreover, general awareness and wider access to the RUGGEDISED produced data will be ensured by including the repository in registries of scientific repositories. DataCite¹⁵ offers access to data via DOI and metadata search, while re3data.org¹⁶ and Databib¹⁷ are the most popular registries for digital repositories. DataCite, re3data.org and Databib are collaborating to

¹⁴ European Commission, "Guidelines on Data Management in Horizon 2020", Version 1.0, 11 December 2013.

¹⁵ DataCite official web site: <u>http://www.datacite.org</u>

¹⁶ Re3data official web site: <u>http://www.re3data.org/</u>

¹⁷ Databib official web site: http://databib.org/

provide open research data services as of 25 March 2014. As the collaboration covers the basic principles of RUGGEDISED for publishing research data, the consortium will pursue membership to them, without excluding new initiatives which may arise during the forthcoming years due to the increased interest for open access to research results and the new European policy framework for sharing and freely accessing data collected during publicly funded research activities. Towards the completion of all aforementioned goals, an initial version of the RUGGEDISED DMP will be provided as a separate deliverable within the first six months of the project. The leader of WP9 on dissemination will be responsible for keeping track of all generated data sets and their life cycle. During the project lifetime, DMP will be a living document and will be updated to address additional requirements arising from newly generated data or the research communicating, regarding sharing options. New versions of DMP will be expected during the mid-term and final review of the project.

In order to evaluate the RUGGEDISED DMP, the following KPIs have been set:

DMP KPIs

 \geq 10 open data management packages uploaded

- \geq 5 repositories, where open data management packages are uploaded
- \geq 1000 downloads

2.2.5 Management of Intellectual Property Rights

The management of knowledge created in RUGGEDISED will be specified in the Consortium Agreement, following well-known models, such as DESCA 2020¹⁸.

Foreground Management will be based on the private area of the RUGGEDISED on-line collaboration tools, which allow cooperative work on "living" documents. The WP9 leader is responsible for the day-to-day Foreground Management.

External dissemination and Knowledge Transfer: The wish and responsibility to publish project results and carry out Knowledge Transfer will be carefully weighed against the necessity to keep s7pecific foreground within the consortium and not to endanger future exploitation. All partners provide information about planned dissemination activities/publications to the consortium and the Executive Board, prior to any activity/publication. Any terms regarding a delay of activities/publications, including the validity of such rule, will be set in the Consortium Agreement.

IPR Management during the project: For the success of the RUGGEDISED project it is essential that all project partners agree on explicit rules concerning IP ownership, access rights to any Background and Foreground IP for the execution of the project and the protection of intellectual property rights (IPRs) and confidential information before the project starts. Therefore, such issues will be addressed in detail within the Consortium Agreement between all project partners.

Consortium Agreement: The purpose of the Consortium Agreement is to establish a legal framework for the project in order to minimize any internal issues within the RUGGEDISED consortium related to the work, IP-Ownership, Confidential Information, Access Rights to Background and Foreground IP for the duration of the project and any other matters of the consortium's interest.

Access Rights to Background and Foreground IP during the project: In order to ensure a smooth execution of the project, the project partners agree to grant royalty-free access to Background and Foreground IP for the execution of the project. Therefore, all project partners determine any Background IP they are willing to submit to the project within the Consortium Agreement before the project starts. Any details concerning the access rights to Background and Foreground IP for the duration of the project will be defined in the Consortium Agreement.

IP Ownership: Foreground IP shall be owned by the project partner carrying out the work leading to such Foreground IP. If any Foreground IP is created jointly by at least two project partners and it is not possible to distinguish between the contributions of each of the project partners, such work will be jointly owned by the contributing project partners. The same shall apply if, in the course of carrying out work on the project, an invention is made having two or more contributing parties contributing to it, and it is not possible to separate the individual contributions. Any such joint inventions and all related patent applications and patents shall be jointly owned by the contributing parties. Any details concerning the exposure to jointly owned Foreground IP, joint inventions and joint patent applications will be addressed in the Consortium Agreement.

Open Access Publications: The scientific publications produced within RUGGEDISED will be open accessed and freely available, in order to maximize the exploitation and impact potential of the project. Both 'gold' and 'green' open access models will be considered. Publishers providing 'gold' access to reputable journals (with high impact factor) will be primarily targeted, making the articles immediately accessed online free of charge, as budget will be reserved for such purposes. Whenever the 'gold' access model cannot be applicable, the 'green' model will be considered, by publishing the final reviewed version of the articles to an online repository, in consultation with the publisher, in case an embargo period is needed, which should last no more than six months. Given that most publishers reinforce longer embargo periods, gold access will be primarily targeted. In any case, repositories not claiming rights, which may prevent open access, will be selected. RUGGEDISED will consider using OpenAIRE¹⁹ to select the proper open access repository and/or deposit publications, allowing also for easy linking with the EU-funded project. Moreover, OpenAIREplus provides linking to research data, in cooperation with re3data.org.

Open research Data: RUGGEDISED will capitalize on sharing knowledge created within the project lifetime, as long as this is feasible, without jeopardizing the project exploitation and impact. Thus, RUGGEDISED will participate in the Open Research Data Pilot, following the Data Management Plan delivered within the early six months of the project and updated for the midterm and final review.

¹⁹ Open Access Infrastructure for Research in Europe: http://www.openaire.eu/

Associated with document Ref. Ares(2016)5910251 - 13/10/2016

Section 3 Implementation

3 Implementation 3.1 Overall Work Plan of RUGGEDISED





WP1: Cross-city Implementation and Innovation in the Lighthouses

The core reason for WP1 is to ensure that whatever solutions are implemented and concepts that will be developed are innovative in terms of achieving a significant breakthrough for large scale implementation and take up. There is a strong link with WP6 (that serves more as the "Research Centre" or "Incubator" for specific scale-up and replication barriers). WP1 is more the "operational glue" among the lighthouse cities, with a group of follower cities attached to it (lighthouse cities have strong glue, follower cities have softer glue). In WP1, an overview of the challenges per city and their solutions will be made and maintained during the project implementation. In addition, specific links between solutions will be defined, including the need to interact or cooperate. "Champion cities" (you could also call them "liaison officers") will take the lead in active knowledge exchange among the lighthouse and follower cities.

Challenges and Solutions in Rotterdam- WP2, Umeå - WP3, and Glasgow - WP4

The core of the project is formed by the lighthouse cities that are implementing and/or upscaling smart solutions to achieve real-life energy savings with integrated solutions within low energy, integrated infrastructure and sustainable mobility. In these WP's all the implementation and development activities that are relevant for Umeå, Glasgow and Rotterdam are combined.

WP5: Monitoring & Evaluation

The main objective of this WP is to monitor the activities in the different lighthouse cities and to analyse the project results in order to provide WP 1 & 6-8 with already analysed data, allowing those three WPs objective decisions based on reliable data, transparent evaluations and valuable expert knowledge. A two year post-implementation phase is planned and it deals with the day-to-day running of the monitoring infrastructure and collecting off-line data needed to get insights and validate the approaches, with the goal of providing project partners and stakeholders with tangible results on the transformation of the district into a low energy district with integrated infrastructure and sustainable mobility.

WP6: Enabling upscaled deployment and business model innovation

The objective of this WP is to establish collaboration structures and deeper knowledge on upscaling potential of

the smart solutions in the Lighthouse Cities in order to generate bankable business cases for upscaling. WP 6 will concentrate on the environment surrounding the concrete demonstration projects. If the demonstrations shall become more than just demos, it is necessary to assess societal aspects that may influence their performance, the energy and governance system. WP6 therefore allows the Lighthouse cities to strengthen their internal capacity and ensure that the demonstrations become a part of an eco-system of Smart City innovation actions. It allows the follower cities to take part in this process too to learn and adapt.

WP7: Replication to Follower cities and knowledge transfer

This WP aims to guide and support Brno, Gdansk and Parma in getting ready for smart solution replication by the end of the project. Further, this WP also seeks to widen the smart city perspective of the follower cities by involving in the knowledge share process 2 international cities that add an external outlook to smart city projects. This is accomplished by cooperating with the cities of Portland and Mumbai.

WP8: Interaction with other Smart City projects

The work package covers resources to contribute, upon request by the Commission, to common integration and dissemination activities to increase synergies between, and the visibility of the SCC1-supported projects.

WP9: Communication and Dissemination

This WP develops and implement a sound dissemination and communication which complements, supports and enhances the in-depth individual city replication and deployment activities.

The defined strategy will ensure an effective communication and dissemination on local, regional, country and EU-level to provide maximum replication of the project.

The substantial dissemination and communication tool mix will ensure an effective and sound target group tailored dissemination and communication of the project in general and its results. It includes the classical dissemination materials such as leaflets, newsletters as well as the social media and the production of a series of short videos showing the project progress in the Lighthouse cities also including interviews of follower cities

WP10: Project Management

This WP will ensure an optimal use of the expertise of all partners and guarantee that the projects' objectives can be achieved within time and budgetary constraints.

WP11: Ethics Requirements

This WP will have two purposes: 1) to identify the relevant national data protection legislation (putting EU legislation into disposition), accompanied by the relevant signed certificates and 2) to provide relevant information on the procedures that will be implemented for data collection, storage, protection, retention and destruction and confirmation that they comply with national and EU legislation and on the informed consent procedures that will be implemented in regard to the collection, storage and protection of personal data must be submitted on request.

3.1.2 Gantt Chart

		Start End	Vear 1 Vear 2 Vear 3 Vear 4 Vear 5 Vear 5 01 02 03 04 01 02 03 04 01 02 03 04
14/104	er te state en		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 25 27 28 29 30 31 32 33 43 35 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 13 54 55 55 57 58 59 60
Task 1.1	Preparing the ground for innovation and implementation of measures in the lighthouse cities	1 6	
Task 1.2	Supporting and coordinating the implementation of the smart solutions	1 38	
Task 1.3	Prototype tools and guidance for decision support and implementation of smart solutions	12 40	
Task 1.4	Documentation of Lighthouse City experiences	32 60	
WP2	Challenges and Solutions in Umea		
Tack 2.1	voor diriationi and mariagement or ure riginirouse acumutes Increase the energy efficiency	1 1	
Task 2.3	Integration of E-Mobility	1 60	
Task 2.4	Enabling low-carbon ICT solutions/infrastructure	1 60	
Task 2.5	Smart city services to the community	1 60	
Task 2.6	Activating the local innovation ecosystem	1 36	
WP3	Challenges and Solutions in Glasgow		
Task 3.1	Coordination and management of the lighthouse activities	1 00	
Task 3.2	Increase the energy efficiency	1 36	
Task 3.3 Task 3.4	incegrad on on conservation of the structure for a structure of the struct	1 36	
Task 3.5	Smart city services to the community	1 60	
Task 3.6	Activating the local innovation ecosystem	1 36	
WP4	Challenges and Solutions in Rotterdam		
Task 4.1	Coordination and management of the lighthouse activities	1 60	
Ta sk 4.2	Increase the energy efficiency	1 36	
Task 4.3	Integration of E-Mobility	1 36	
Task 4.4	Enabling IOW-carbon IC I Solutions/Intrastructure Conset situe environs to the community.	1 1	
Task 4.6	Activating the local innovation ecosystem	1 1	
WP5	Monitoring and Evaluation		
Task 5.1	Specification of the monitoring methodology	1 12	
Task 5.2	Set up of the monitoring structure	13 24	
Task 5.3	Data collection	2 60	
Task 5.4	Continuous Analysis	18 60	
Tack 5.5	Priocess Evaluation Immach &seessment	, 20 55 60	
MD6	Enabling upscaled deployment and business model innovation	2	
Task 6.1	Urban Innovation Platforms	6	
Task 6.2	Developing methods for innovative business models for upscaled deployment.	18 48	
Task 6.3	Contextual Scenarion Analysis	10	
Task 6.4	As sessing the long-terms caling potential and energy system effects of the light house smart solution in the second	tic 18 30	
Task 6.5	Uraban innovation system analysis Re nication to Follower dties and knowledge transfer	18 20	
Task 7.1	Empower the cities through knowledge share and training	1 59	
Task 7.2	Assess the state of play and establish the smart city governing groups	1 60	
Task 7.3	Deliver a vision and an implementation roadmap with participatory foresight	7 39	
Task 7.4	Deliver the replication plans	7 59	
WP8	Interaction with other Smart City projects		
Task 8.1	Contribution, upon request by the Commission, to the development of information material such as ne Destrictionation and/or contribution more request by the Commission to information trainion and discon	- 1 PO	
Task 8.2	Participation and/of contribution, upon request by the continues but, to information, it aming and usset Delivery, upon request by the Commission, of an update/further input of the project's contribution to the		
6dM	Communication		
Task 9.1	Dissemination and Communication strategy	16	
Task 9.2	Visual identity, promotional tools and translations	1 12	
Task 9.3	Traditional and digital media outreach, scientific publications and e-updates	1 1	
Tack 0.5	cross-rierunsauon between ciutes and bus intess Ca pacity Building & exploitation	1 00	
Task 9.6	Citizen and stakeholder engagement at a local level	1 60	
Task 9.7	Monitoring and evaluation	1 60	
WP10	Project Mangement		
Task 10.1	Administrative Management	1 60	
Task 10.2	Contractual, financial and organisational management	1 60	
Task 10.5	Initiovation Management, including tisk management, and quantity assurance Internal and external Communication	1 1	
Task 10.5	Periodic reports	1 60	

3.1.3 Work package descriptions

3.2 Management Structure and Procedures

3.2.1 Organisational Structure

An initiative the size and ambition of RUGGEDISED requires clear leadership as well as collegial and inclusive decision-making. The complexity of the project shall thus be met with an organisational structure that succeeds in allocating clear-cut tasks and complementary responsibilities. Accordingly RUGGEDISED identifies the following three levels of coordination and management:

- 1. **Project Government** provides strategic project direction as well as dedicated venues for collegial discussion and decision making (ROT).
- 2. **Project Operation** guarantees the daily operation of all project activities providing at once technical management, as well as administrative and financial coordination (UNR).
- 3. **Project Advice** ensures scientific excellence, advice and validation working both from within the project and outside the project with recognised Smart Cities experts (AIT).

As shown in the next figure, the three levels are delivered via five groups that work in close cooperation.



Figure 3-2: The three levels and five groups

The task of **project coordination** and management is to ensure that goals are achieved in full, and possibly exceeded, within time and cost limits and at high quality standards. The main fields of activity include the *government of the consortium*, which entails the facilitation of communication and the integration of heterogeneous cultures, the *technical and day-to-day coordination of work*, the *financial and administrative coordination of the project*, and the *maintenance of an official and continuing line of communication* with the EC and the other relevant Smart Cities actors.

The **Steering Group (SG)** is the foremost decision-making body of the project and includes as members the six cities (through representatives of each City Governance, see below), the Project Management Group (PMG), and the leaders of the remaining work packages (WP1, WP5, WP6, W7, WP8 and WP9). It is chaired by the PMG.

The responsibilities of the Steering Group are:

- Discuss and decide on strategic issues.
- Decide on project disputes.
- Monitor the progress of the project and adjust, if necessary, contents and objectives.
- Approve public reports and deliverables.
- Decide on strategic contractual and financial matters.

The Steering Group meets every month via teleconferencing, and in person if necessary - in correspondence with other project events, and works according to the specifications outlined in the Consortium Agreement. Each meeting is prepared by the Chair and the Project Management Group, which report on the status of the project and introduce the discussion points.

The **City Governances Group (CGG)** brings together the individual City Governances established in each RUGGEDISED city. These are the main city-level decision-making and coordination bodies and consist of the

public authorities of the six cities as well as the industrial, research and academic partners involved in the local smart cities projects. These governances ensure that all local project activities proceed according to plans, that deviations and newly emerging opportunities are met through adequate contingency actions, and that local disputes are resolved. Each group is chaired by a *Chief Productivity Officer (CPO)*, which also takes part in the Steering Group and in the City Governances Group (thereby effectively linking these two strategic bodies). Each City Governance meets regularly throughout the project, and at least twice a year. Depending on the issues at stake, it is expected that the groups will invite to join the meeting members of key non-partner stakeholders, including members of the civil society as well as parties that pledged to support RUGGEDISED from outside the project. The *Chief Productivity Officer (CPO)*, and the assisting staff, is in charge with the following main tasks:

- Perform day-to-day local management.
- Coordinate the local partners, facilitating communication, the exchange of results and the participation of project partners, as well as representatives of local stakeholders and civil society, in project conferences, meetings and workshops.
- Monitor all local activities, ensuring that objectives and outputs are met on time, to quality and cost.
- Ensure that all contributions to vertical and horizontal work packages are delivered in time and quality.
- Coordinate the local administrative and financial reporting as well as any other administrative and financial issues.
- Represent the local project externally and act as the official communication point.

- Represent the site in the Steering Group, and thereby conveying the local strategies and requirements. The City Governances hold a key project role, but as such they are also bound to add extra value by providing local authorities and stakeholders with a venue where diverse roles, cultures, needs and mind-sets come together in a structured environment. As largely demonstrated by other EU projects, these settings play a pivotal role in facilitating paradigmatic shifts, and in the case of RUGGEDISED we expect institutions, industries and civil societies to better understand the foundations and the benefits of smart cities, as well as the individual obligations and opportunities that these entail. Through the City Governances, is the ambition of RUGGEDISED to establish formal working procedures and collaborative attitudes that will survive after the end of the project to become fundamental levers for future vision and decision-making. The City Governances Group convenes less often than the Steering Group, but frequent enough to share information and prepare meetings of the Steering Group. Chaired by the Project Coordinator the group meets to:

- a) provide updates on city progress and asses the course of the project,
- b) facilitate cross-city knowledge spill-over with emphasis on governance issues,
- c) identify issues that need addressing in the Steering Group.

The **General Assembly (GA)** brings together representatives of all project partners once every six months to strengthen personal and professional relationships, obtain a privileged update on project progress, issues and opportunities, share experience and participate in dedicated project events. Chaired by the PMG, the meetings of the General Assembly are also an occasion for formal and informal bilateral meetings between partners, between partners and the PMG. The first and last meetings of the General Assembly are also the springboard for wider reach events such as the Kick-off and Final Conference.

The **Project Management Group (PMG)** consists of the Project Manager (UNR), The Innovation Manager (AIT) and the Project Coordinator (ROT), and deals with day-to-day coordination and management of all project activities. The group, which is chaired by the Project Manager, oversees the production of reports, facilitates integration and knowledge spill-over across the consortium, proposes changes to the technical work programme if necessary, and ensures that the scientific progress of the project is in line with the objectives and possibly goes beyond.

The Project Manager, the Innovation Manager and the Project Coordinator install dedicated project offices and work in team and seamless communication according to the following clear repartition of responsibilities.

Table 3-1 responsibilities of the Project Coordinato	r, the Project Manager and the Innovations Manage
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	Project Coordinator	
Function	Strategic Coordination	
Name	Albert Engels (ROT) – Project Coordinator	

External links	Acts as the main contact point (EC, Smart Cities Initiative, other parties).
Consortium	 Chairs the GA (1 meeting every six months): main collegial body where all partners come together to improve personal and professional cooperation, appreciate the progress of the project, participate in capacity building sessions. Chairs the SG (monthly telephone calls): prepares, facilitates and reports on the meetings of the SG. Consults with the PMG for the identification of the discussion items, which are drawn from the daily operation of the project as well as from the priorities identified by the City Governances Group. Chairs the CGG (regular meetings, preceeding the SG): prepares, facilitates and reports on the meetings of the CGG, which is the main controlling body for the local lighthouse and replication projects. Thanks to the multidisciplinary expertise of ROT, it oversees the work of the individual governances, facilitating the share of knowledge, management of problems and opportunities, etc. Communicates regularly with and facilitates the cooperation inside the SG and CGG to ensure the effective deployment of the activities of the two bodies. Addresses the whole consortium when strategic issues of collective interest arise.
Work plan	 Oversees the work of the City Governances, thereby steering and facilitating the achievement of the strategic objectives of these governances. When needed, it offers the CGs with technical support/counsel across all smart cities sectors. Oversees the strategic course of the project by leading the SG, ensuring that the goals of the SCC Call and of the GA are met in full.
Meetings	 Handles the meetings of the SG and CGG. Co-prepares the meetings of the PA.
Deliverables	- Provides a final quality check and submits with the EC.
Periodic reports, fin.management	- Provides a final quality check, submits to the EC, and distributes payments.

	Project Manager		
Function	Project Operations Management		
Name	Kathrin Braun (UNR) - Project Manager		
External links	Acts as the main contact point for administrative and financial issues (EC).		
Consortium	 Chairs the PMG: makes sure that UNR, AIT and ROT are in seamless communication and close cooperation (through continuing phone conferences, exchange of emails, personal meetings in occasion of other institutional project events or ad-hoc meetings whenever necessary), informing and consulting each other on issues of particular relevance that require a consensual approach. Communicates seamlessly with the entire consortium on the unfolding of the daily activities of the work plan. It is the main support point for all work packages (cities and horizontal partners). Facilitates seamlessly cooperation and communication across the consortium. 		
Work plan	- Oversees the operational unfolding of the work plan, which involves: the smooth and timely deployment of all activities (WP1 through WP9), the solutions of problems, the delivery of outputs and deliverables		
Meetings	- Organising and documenting project meetings, like General Assembly, including distributing documents before and after meetings;		
Deliverables	- Managing deliverables and administrative documents, e.g. financial plans, (progress) reports and presentations;		
Periodic reports, fin.management	 Producing and updating overviews of consortium expenses and deviations and keeping track of financial transactions between the EC and the consortium; Coordinate the preparation of the periodic management reports and the final report; Collect, check and send to the EC the required cost statements, on the basis of the scheduled plan using the systems as provided by the EC. 		

	Innovation Manager	
Function	Project Advice Management	
Name	Klaus Kubeczko (AIT) – Innovation Manager	
External links	Acts as the main contact point for innovation management, quality assurance, and risk management.	

Consortium	 Chairs the Advisory Board (1 annual meeting): meets with the panel of experts to discuss strategic issues regarding innovation potentials and innovation capacities Communicates with the SG regarding quality standards for deliverables and needs for independent reviews Identifies the reports and the experts that will independently review select project deliverables. Communicates regularly with the three Thematic Liaison Groups (Task 1.2) regarding the innovation and implementation framework and lessons learned, and provide strategic advice if required. Communicate regularly with the Urban Innovation Platforms (T6.1) regarding upscaling potential and barriers, and provide strategic advice if required Communicate regularly with the Smart City Governing Groups (T7.2) regarding replication potential and barriers, and provide strategic advice if required
Work plan	 Oversees the integration of the RUGGEDISED Lighthouses by supervising the smooth working of the innovation network activities (Thematic Liaison Groups, Urban Innovation Platforms, Smart City Governing Groups), Steers the SG decision-making process on risks and project amendments identified by UNR. Oversees the innovation activities , which involves: the attainment of objectives, the identification and management of risks and needs for project amendments.
Meetings	 Handles the meeting with the AB Provides risks status/overview and quality control-related issues Consults with the SG on strategic issues regarding innovation management, quality management and risk management
Deliverables	 Provides guidelines for structuring of the deliverables and quality standards Provides contents- and quality-check, and sends to ROT.
Periodic reports, fin. management	 Provides a thorough quality check on innovation management issues. Contributes to the periodic management reports regarding innovation management issues

The **Advisory Board (AB)** consists of recognised experts in smart cities which independently assist the project by providing scientific and technical advice on select project activities and outputs, as well as an external perspective on innovation potential and innovation capacities. Chaired by the Innovation Manager, the group adopts a variable-geometry approach whereby individual or a sub-group of experts selected from a roster are called to provide counsel, analysis, capacity and validation on items such as key project deliverables and capacity building events. The Advisory Board meets once a year in parallel with the meetings of the Steering Group. Members of the board will also be involved in additional meetings via remote forms of communication as appropriate. Below is a list of board members, which will be consolidated and finalised as the project kicks off.

Table 3-2 confirmed list of independent experts

Name	Affiliation	Main areas of expertise
Wolf D. Prix	Founder of Coop Himmelb(I)au	Award winning architect
A. Van Timmeren	Professor from TU Delft	International expert in smart cities
Graham Colclough	UrbanDNA	International expert in smart cities
Thomas Olofsson	Professor from Umeå University	Expert on energy technology and energy efficiency (particularly focus on buildings)

3.2.2 Other Key project roles

The work plan unfolds under the operative coordination of **work package** and **task leaders**. They are responsible for the following activities:

- Coordinate the activities of their work packages and tasks, ensuring that the methodologies, technologies, events and deliverables are delivered as planned, to time and quality.
- Facilitate communication and collaboration amongst the involved partners.
- Ensure work integration with the other relevant work packages and tasks.
- Facilitate the transfer of knowledge across work packages, tasks and cities.
- Gather the information for the periodic reports.

Task leaders work under the coordination of work package leaders, and the latter work under the coordination of the Project Coordination Office and Project Management Office.

Each smart solution is linked with a reference **smart solution leader**, which ensures work coordination, adherence with plans and objectives, information gathering for knowledge exchange and periodic reporting. The next is a summary overview of the interrelations among the various project leaderships.

Table3-3: interrelations between key project roles

Leader of	Role	Reports to
Work Package	 Coordinates the activities of the work package Coordinates with the other work packages Handles periodic reporting for the work package 	Project Coordinator and Project Manager
Task	 Coordinates the activities of the task Coordinates with the related tasks Handles periodic reporting for the task 	Work package Leader

3.2.3 Project meetings and communication channels

The table below explains the members, their roles and meeting frequencies of the different management bodies:

Governance Body	Meeting intervals	Members (chair)	Tasks
General Assembly (GA)	Every 6 months	All project partners (Coordinator)	Share experience and update on project situation. Participation at project events
Steering group (SG)	Every month via teleconferencing, and in person if necessary	Project management group, city governance group and WP leaders (Coordinator)	Project decision-making body
Project Management group (PMG)	With Steering group meetings + teleconferences	Project Coordinator, Project Manager and Innovation Manager	Keep track of monthly progress, preparation of changes to the project in terms of innovation goals, finances, quality, risk management, dissemination and exploitation
City Governances group (CGG)	At least twice per year	Lighthouse and Follower Cities (Coordinator). For the follower cities these meetings coincide with those presented in WP7.	Ensure that all local project activities proceed according to plans
Advisory Board (AB)	Once per year (combined with GA meeting)	External Smart City Experts, Project Coordinator (Innovation Manager)	Provide scientific and technical advice on select project activities and outputs of strategic importance

Table3-4: Project meetings and communication channels

Additionally, the project maintains the following regular internal communication channels:

- Phone, Skype and email correspondence.
- Minutes from all meetings, both physical and virtual.
- Official communication from the Project Coordinator to the entire consortium every three months (after each Steering Group meeting) to provide updates on key facts and decisions.
- Web based internal communication and working tools as specified in WP9.

3.2.4 Quality assurance

The consortium applies internal and external quality control mechanisms to validate headline outputs and deliverables. While the Project Coordinator, the Project Manager and the WP leaders ensure the ordinary delivery of high quality standards to all project outputs, other partners and external experts are called to provide an additional expert perspective in the case of particularly high-profile outputs. The list of deliverables and respective internal reviewers will be consolidated at project outset. A dedicated task (in WP10) will determine a Quality Assurance procedure including the flow of information, timing to meet the Deliverable deadlines,

responsibilities and Deliverables acceptance criteria. AIT will prepare the Quality Assurance procedure and discuss this with the PMG and the Steering Group.

3.2.5 Project Risks

Since the failure risk probability of Innovation projects is present, risk factors in the RUGGEDISED work plan shall be analysed on a regular basis.

In addition, the RUGGEDISED project works with cities, which are living laboratories influenced by a number of political and socio-economic factors, a fraction of which is controllable by the project.

Nevertheless the consortium counts on the very strong political commitment of the six involved Mayors and City Councils, on a solid and vested industrial partnership, and on an articulated team or academic, research and consulting parties with extensive experience of the risks that projects of this scale might encounter over a long period of deployment. That is in itself the greater asset the project can offer in offsetting possible complications and deviations.

As explained before, the Innovation Manager, in close cooperation with the Project Manager and all partners, will closely monitor the risks identified by applying risk management procedures that entail a systematic and informed understanding of relevant risks, an assessment of their relative priority, a rigorous approach to monitoring and controlling them. This process seeks to maximise the chances of objectives being achieved and ensuring that all organisations, individuals and communities are aware and contribute to finding solutions. Furthermore, risks occasionally allow for the exploitation of the opportunities that uncertainty brings, tacking stock of new and unforeseen possibilities. WP10 contains a task dedicated to risk management (task 10.3 Innovation Management, including risk management and quality assurance).

Each city will in turn monitor the local risks, with specific attention to those associated with the individual smart solutions. The Steering Group and the City Governances will be the ultimate venues should risks require decisions.

To minimize risks partners have already identified possible risks presented below. Risks related to specific WP tasks are presented in a risk assessment table (Table 3-5). As part of the Risk management plan, this table will be monitored by the Innovation manager and PMG and updated accordingly ensuring that risks are identified and contingencies developed as early as possible. Risk reporting and early warning system, will feed into the overall project reporting and will be linked to evaluation and related training activities.

Personnel and administrative risks

If qualified project managers are not found in time there are risks for delays in these tasks. There can also be a risk that someone with an important role in the project coordination gets another job, goes on parental leave or by some other reason leaves the project. Administrative risks could occur if documents and information are not available to relevant parts of the project team.

Contingency actions

The personnel and administrative risks will be reduced by a system with open files accessible to local managers in all Lighthouse cities (internal web site), an extensive cooperation between the cities and close cooperation between the work package leaders. It is important to not have only one person with all the knowledge of RUGGEDISED at the Lighthouse cities. For successful project implementation, knowledge must always be spread and shared.

Political risks

There is broad political consensus in the Lighthouse cities on the importance of the proposed measures, and the specific objectives are decided in city plans, in many cases in charge since several years. Increased energy efficiency and renewable energy, are together with reduced emissions of greenhouse gases, over-arching goals for both the RUGGEDISED cities and the EU as a whole. The risk that decision makers withdraw the investments in the cities are regarded as a merely theoretical risk.

Contingency actions

A range of dissemination and awareness-raising measures, as well as feedback and evaluation mechanisms, are built into the project structure and these will be adjusted if necessary. Stakeholders will be integrated throughout the project and will be not only beneficiaries of the measures carried out, but also as active participants. The consensus in the cities on the importance of the proposed measures and by the cities implementing and disseminating these measures jointly in the project increases the political and public support.

Technical risks

RUGGEDISED will demonstrate a number of methods and technologies related to mobility, smart communication, energy efficient appliances and integrated infrastructures. Though market ready, not all users are readily accepting new technology and it may hence not deliver the expected effects. Failure in properly information to stakeholders could generate some resistance amongst residents.

Contingency actions

Companies delivering innovative technologies are either partners in the project or local partners, guaranteeing fast response in the event of any problem impacting upon service delivery. Effective and innovative information to the users of the new technology and strategic information of the new technical solutions will increase the level of user acceptance and also mitigate any negative reactions from the public. Effective dissemination of information, opportunities for training and availability of feedback mechanisms, together with research and evaluation of both the techniques and their socio-economic impacts, will help users get accustomed to innovative methods and technologies, and enable the project coordinators to adjust or modify aspects of new installations to better suit user needs.

Financial risks

Other resources of funding can be a risk.

Contingency actions

All funding sources, other than EU contribution, are secured and all financial contributors have guaranteed their financial contribution will be available at the appropriate time in letters of intent or letter of support and enclosed in appendixes to this proposal. For more information please see section 3.4 resources.

Risks related to specific WP's and tasks

To minimize risks in the WP tasks the partners have already identified possible risks tasks and contingency planning within these tasks.

3.3 Consortium as a whole

The RUGGEDISED consortium represents a unique mix of 6 (six) Lighthouse and follower cities - wellbalanced in terms of geographical coverage - 15 (fifteen) industry partners, 9 (nine) leading academic partners and 4 (four) SMEs service providers. The consortium partners build on earlier collaboration both at the local level (city with industry partners) and at EU project level. All three Lighthouse cities have had an active urban sustainability agenda for many years and have signed and submitted Sustainable Energy Action Plans in the Covenant of Mayors²⁰.The synergy between the lighthouses can be seen in the common challenges presented in section 1.3.2.

The consortium comprises 34 partners located in 8 different European countries. The follower cities Parma, Brno and Gdansk ensure the project represents also Eastern and Southern Europe, as shown in Figure 3-3.

The consortium is further enriched by Portland (USA) and Mumbai (India).

3.3.1 Consortium capabilities



Figure 3-2: Spread of lighthouse (red dots) and follower cities (green dots) through Europe

²⁰ http://www.covenantofmayors.eu

The consortium gathers public authorities, the industrial sector, the research community, multinational corporations, and innovative SMEs. It shows a strong and dynamic public sector steering, and a healthy involvement of industries and highly innovative SMEs. The scientific depth of the project is guaranteed by university/research center involvement, with 9 participating academic institutions spread out across all lighthouse and follower cities as well taking part in the horizontal activities of the project. The three thematic pillars of SCC are comprehensively grounded in the industry, which actively invests and participates in the project with national and multinational corporations active in the Energy, Real estate, ICT and Mobility sectors.

The smart cities activities of RUGGEDISED are deployed in collaborative and diverse socio-economic and climatic contexts, ranging from Nordic to Mediterranean countries, to places across the Atlantic.

Each of the main actors and WP leaders has extensive experience in the smart city sector and most are involved in, at least, one running FP7/ H2020 Smart Cities projects. In particular:

- ROT: partner in 'Celsius' <u>www.celsiuscity.eu</u> (FP7 project, GA No. 314441)
- GCC: STEP-UP Glasgow, Riga, Gothenburg & Ghent working together to create smarter more sustainable cities.
- AIT: coordinator of 'Smarter together'
- SP: coordinator of 'Sinfonia' <u>www.sinfonia-smartcities.eu</u> (FP7 project, GA No 609019)
- ISINNOVA: partner in the study/tender 'Analysing the potential for wide scale roll out of integrated Smart Cities and Communities solutions' (a study funded by DG Energy). Within this study ISINNOVA has collaborated to the selection and analysis of 80 smart cities solutions (of which 50 realised in the EU and 30 mostly in USA and JP) rolled out in 60 cities.
- ICLEI: partner in 'Grow Smarter' <u>www.grow-smarter.eu</u> (H2020 project, GA No 646456) as expert on public procurement of innovation, communication and dissemination
- TNO: partner in 'City-Zen' www.cityzen-smartcity.eu (FP7 project, GA No 608702)

RUGGEDISED Lighthouse and Follower Cities

Rotterdam, Umeå and Glasgow are committed to a long-term transformation of their economy and regeneration of former industrial, port and university areas and have embraced the concept of the 'smart city'.

Rotterdam is a frontrunner in 'Energy' and has developed the Rotterdam Energy Approach and Planning (REAP1 and 2) which incorporates CO₂ and energy savings directly into the urban planning and development process. Rotterdam is an active member in different European and worldwide networks: Clinton Climate Initiative C40, Covenant of Mayors, EUROCITIES, METREX, etc.

The Urban Development department has extensive experience as a co-ordinator in Interreg IVB/ MUSIC, CIVITAS/TELLUS and the URBACT/My Generation projects as well as H2020 projects.

The city of **Umeå** is one of the fastest growing cities in Europe, with a strong focus on research and development. It is also very active in several international networks, and currently holds political positions as first vice-President for the Union of Baltic cities and is a member of the CIVITAS Political Advisory committee.

Glasgow has made major investments in its civic, cultural and sporting infrastructure working with partners in the private, public and third sectors. In 2009 Glasgow City Council (GCC) established Sustainable Glasgow, a platform bringing together all the key players from the public, private and academic sectors to help the city achieve its CO₂ emissions reduction target of 30% by 2020 (from 2006/07 levels). In April 2014, Glasgow was named as one of the first members of the Rockefeller Foundation's 100 Resilient Cities Network.

Brno has its local smart city initiatives: 'Brno City Strategy', a long-term binding document which exceeds horizons of electoral terms. It is a document which contributes to the further development of the city. It is based on five priorities fundamental for Brno - Image of the city and internal/external relations, Local economic development, Quality of life, Research, development, innovations and education, Transport and technical infrastructure. Besides this City strategy office cooperates with investors, universities and private companies.

The City of **Gdańsk** has in its structure substantive departments, which for many years perform international cooperation projects devoted to various topics. These projects cover issues related to improving energy

efficiency, reducing CO₂ emissions, implementing innovative activities in the field of active mobility and the use of ICT tools in the management of various sectors of the city.

The City of **Parma** is increasing competitiveness with the redevelopment of historic areas; energy efficiency and sustainable mobility initiatives; the restructuring of industrial buildings and green areas; more efficient ICTs; improved air quality; and higher rates of recycling and separate waste collection. The city is involved in many different SEAP activities.

All follower cities reported their commitment to replicate 27 of the Smart Solutions addressed and performed by the lighthouse cities. Their letters of Commitment can be found in the Annex A to this proposal (section 4-5).

Other WP leaders

The **AIT** Austrian Institute of Technology, Austria's largest non-university research institute, takes a leading position in the Austrian innovation system in the areas of smart cities Energy, Mobility, Health & Environment, Safety & Security as well as Innovation Systems and a key role in Europe as the RTO focusing on the key infrastructure topics of the future. The Department Innovation Systems is dedicated to research and policy support in the context of regional, Austrian and European research technology and innovation policy. The staff involved in the RUGGEDISED project is expert – among other - in replication, monitoring (KPI's) and impact assessment.

ICLEI Europe, represent a network of cities and has a strong multilingual information and communication team, experienced with developing communication strategies and tools. The team delivers strategy, design, communication materials and manages the dissemination requirements of a number of projects at European, regional and national levels in the field of energy and sustainable development. In addition to its membership network, ICLEI Europe has observer status with the United Nations Framework Convention on Climate Change (UNFCCC) and is a Covenant of Mayors (CoM) Supporter – in which capacity it shares information, mobilizes and facilitates the exchange of energy /climate relevant experiences between local governments

ISINNOVA is an independent research institute expert in implementation and the evaluation of sustainable policies in the fields of transport and mobility, urban planning, energy, environment, and knowledge society. It has played an important role in the conception and implementation of some of the most significant projects carried out in Europe, participating, both as leader and as partner, in over 80 EU funded projects from FP4 to FP7, as well as other EU programmes such as IEE and Interreg. The FP7 Monitoring report 2012, ranks ISINNOVA 13° in Europe and 2° in Italy as SME with the highest numbers of participations in FP7 signed grant agreements during the period 2007-2012.

SP Sveriges Tekniska Forskningsinstitut AB (SP Technical Research Institute of Sweden AB) is the national institute for technical research, evaluation, testing, certification and calibration. SP has been very successful during the last years in setting up business case development in EU funded Smart Cities projects. The projects are carried out in close alliances with public and private actors in Sweden to foster innovation towards sustainable cities. SP currently participates in 3 Smart Cities projects of which it coordinates one; SINFONIA.

TNO is an independent research, development and consultancy organisation in the Netherlands. TNO is a key player a large number of European research and policy networks related to Smart Cities, and it is represented in the Sherpa Group on the EIP Smart Cities and the SCC marketplace Action Clusters Integrated Planning and Business Models. TNO participates in the EERA Joint Programme on Smart Cities as and is also involved in EERA JPs on CCS and Geothermal. Further, TNO has strong links with networks as ICLEI-Local Governments for Sustainability, Green Cars Initiative, CIVITAS, EARPA, ERTRAC, etc.

The large industrial partnership (15) is equally well suited to deliver on the smart solutions thanks to the direct commitment of high profile corporations such as Siemens.

RUGGEDISED also has the support of the research community (9) plus innovative consulting companies and innovative SMEs (4) such as Pictec and Uniresearch. This presence ensures that the thriving EU sector represented by the myriad of micro, small and medium enterprises is finally in a position to establish a direct

dialogue and cooperation with public authorities and larger industries, and is able to insert their solution in a readier smart city market.

3.4 Resources to be committed

3.4.1 Table 3.4a: Summary of staff effort

	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	WP10	Total PMs
ROT	13.0	49.0			3.0	13.5	0.5	5.0	13	40.0	136.8
UME	7.0		60		3.0	13.5	0.5	5.0	12.8	2.0	103.8
GCC	7.0			78.0	3.0	13.5	0.5	5.0	12.8	2.0	121.8
SP	11.0		10		10.0	31.0	2.0	0.5	1.8		66.3
ISINNOVA	8.0				2.0	2.0	43.0	5.0	1.8		61.8
AIT	10.0				61.5	10.0	14.0		1.8	16.0	113.3
TNO	25.0	6.0			16.0	10.0	2.0		1.8		60.8
ICLEI	4.0	3.0	3	2			2.0	5.0	64		83.0
EUR	4.0	34.0				8.0			6.8		52.8
UU			28		6.0				1.3		35.3
US	13.0			12.0	8.0	10.0		0.5	1.3		44.8
UB							25.0		1.3		26.3
Brno					2.0		47.0		3.4		52.4
Parma					2.0		47.0		3.4		52.4
Gdansk					2.0		37.0		3.4		42.4
BN		31.0			0.5			0.5	0.3		32.3
RET		35.0			0.5				0.3		35.8
ENE		33.0			0.5	2.0			0.3		35.8
KPN		34.0			0.5				0.3		34.8
AHAB			25		0.5				0.3		25.8
VCC			30		0.5				0.3		30.8
UEAB			35		0.5	2.0			0.3		37.8
UPAB			16		0.5				0.3		16.8
TS				11.0	0.5				0.3		11.8
SPPS				16.0	0.5	2.0			0.3		18.8
тсв				6.5	0.5				0.3		7.3
SIE				34.0	0.5				0.3		34.8
PIC							14.0		0.3		14.3
UNR								4.5	0.3	48.0	52.8
INF					0.5		18.0		0.3		18.8
FI		30.0							0.3		30.3
WG				4					0.3		4.3
GIWK							13		0.3		13.3
SI					0.5	7.0			0.3		7.8
Total PMs	102	255	207	163.5	125.5	124.5	265.5	31	136.4	108	1,518.4

3.4.2 Table 3.4b: 'Other direct cost' items

The next table shows the justification related to 'other direct costs' for each partner.

((*)	Total	other	direct	costs	exceeding	15% of	personnel	costs
	`'	rotui	other	ancet	00505	checcumg	13/0 01	personner	00505

Cost (€)	Justification
72,694	Travel costs for project meetings and workshops
226,200	Audit costs=3.000
	WP10: 145.000 (organisation of kick-off meeting and final GA=100.000; 20.000 for advisory board meetings; 25.000 for travels of Rotterdam to Mumbai and Portland); WP2: 70.000 for Alis (20.000) and waste management (50.000) WP9:1.000 (entrance fees to events); WP7:2.000 hosting of follower city visits
	WP6:3.200 hosting 3 workshop (business models, energy system analysis, scenario analysis)
	Cost (€) 72,694 226,200

Total		296,894	
2. U	IME	Cost (€)	Justification
Travel		49,569	Travel costs for project meetings and workshops
Other goo	ds and	29,200	Audit costs=3.000
services			WP3: 20.000 for hosting and measurement equipment; WP9:1.000 (entrance
			fees to events); WP7:2.000 hosting of follower city visits; WP6:3.200 hosting 3
			workshop (business models, energy system analysis, scenario analysis)
Total		78,769	· · · · · ·
3. G		Cost (€)	Justification
Other good	daand	48,494	Audit costs for project meetings and workshops
other good	us anu	89,200	Audit Costs=3.000 WDA: Durchase of licenses required for Data Decision Based Diatform _ £80.000;
Services			WP9.1 000 (entrance fees to events): WP7.2 000 hosting of follower city visits
			WP6:3.200 hosting 3 workshop (business models, energy system analysis,
			scenario analysis)
Equipment	t	926,000	Purchase of battery storage & control equipment for EV charging hub –
			€550,000; Purchase of innovative PV canopy on EV charging hub structure -
			€270,000;
			Purchase of innovative building-mounted ducted wind turbines - €51,000;
			Purchase of domestic storage & control equipment for demand-side
			management - €55,000
Total	D	1,063,694	
4. SI	Ρ	COST (€)	JUSTIFICATION
ITavei		37,000	WP7 Replication
Other goo	ds and	3,300	Audit costs: 3.000
services			WP9: 300 (entrance fees to events)
Total		40,300	
5. IS	SINNOVA	Cost (€)	Justification
Travel		47,009	I ravel costs for project meetings and workshops of which 17.880 for travels in WP7 Replication
Other goo	ds and	3 300	Audit costs: 3 000
services	us unu	3,300	WP9: 300 (entrance fees to events)
Total		50,309	
6. A	JT	Cost (€)	Justification
Travel		40,075	Travel costs for project meetings and workshops
Other goo	ds and	13,930	WP 10 audit costs 5.000 EUR
services			WP5 LRI costs 3.630 EUR
			WP5 Data transfer, temporary data measurement points 5.000 EUR
T - + - 1		F 4 00F	WP9: 300 (entrance fees to events)
	NO	54,005	luctification
Travel	NU	27 750	Travel costs for project meetings and workshops
Other good	ds and	2 3 200	Audit costs 3 000
services		3,300	WP9: 300 (entrance fees to events)
Total		31,050	
8. IC	CL*	Cost (€)	Justification
Travel		23,800	Travel costs for project meetings and workshops
Other goo	ds and	81,500	Audit costs:3.000
services			WP9: 78.500 (Organisation of events related to dissemination and
			communication; entrance fees to events)
Total		105,300	
9. E	UR	Cost (€)	Justification
Travel		16,650	Travel costs for project related meetings
Other goo	ds and	3,000	Audit costs:3.000
Total		10 650	
10 11	111*	(ost (£)	lustification
10. 0	-	3030 (0)	

	10.175					
Travel	10,175	Travel costs for project related meeting	şs			
Other goods and	3,000	Audit costs:3.000				
services						
Equipment	100,000	WP3: 100.000 (ICT - base stations with	WP3: 100.000 (ICT - base stations with high capacity for positioning of			
		connected devices (U9))				
Total	113,175					
11. US	Cost (€)	Justification				
Travel	15.725	Travel costs for project related meeting	75			
Other goods and	3,000	Audit costs	<u>,</u>			
services	3,000					
Total	18 725					
12 LIB	(ost (£)	lustification				
Travel	6 001	Travel costs for project related meeting	ts of which 7000 for travel in W/P7			
Total	6,901	Traver costs for project related meeting				
10ldi	6,901					
13. Brno*	Cost (€)	Justification				
Iravel	19,595	WP7 Replication	orkshops of which 30.200 for travel in			
Other goods and	14,020	WP7: 13.520 (Replication of smart solu	tions)			
services		WP9: 500 (entrance fees to events)				
Total	33,615					
14. Parma*	Cost (€)	Justification				
Travel	19,595	Travel costs for project meetings and w	orkshops of which 30.200 for travel in			
	47.000	WP7				
Other goods and	17,020	Audit costs: 3.000				
services		WP7: 13.520 (Replication of smart solutions)				
		WP9: 500 (entrance fees to events)				
Total	36,615					
15. Gdansk*	Cost (€)	Justification				
Travel	19,595	Travel costs for project meetings and w	orkshops of which 30.200 for travel in			
		WP7 Replication				
Other goods and	14,020	WP7: 13.520 (Replication of smart solu	tions)			
services		WP9: 500 (entrance fees to events)				
Total	33,615					
16. BN*	Cost (€)	Justification				
Travel	7,400	Travel costs for project related meeting	şs			
Other goods and services	3,000	Audit costs				
Equipment	510,000	Smart Solution	Specification			
		R1: Geothermal heat-cold storage	Development of 500 - 1000 m of heat			
		and heat pumps (Ahov. ICC and	pipes through the inner city area.			
		artsbuilding, 50 M swimmingpool)	Realizing a buffer for heat-cold			
		Costs: € 170.000	storage			
			Appendages: valves pumps et cetera			
			Adapting control technology in the			
			various buildings			
			Realizing connections of the			
			hydraulically separated connections in			
			the various buildings			
		R2: Thermal energy from wasto	Realise 50 m thermal energy waste			
		strooms	recovery			
		Costs: £ 127 500	Realise connectivity points in area			
		CUSIS. & 127.300	Hydraulic and thermal connection			
			with operaveystoom			
		D2. Surface water heat sold	Dormite for thermis full utilization of			
		no. Surface Water neat-cold	surface water			
			Surface Water.			
		CUSIS: € 127.500	Realizing of an area pipe for the			
			connection to surface water.			

		R4: Pavement heat-cold collector Costs: € 85.000	Realizing intake points, absorption pits, filters. Realizing connection to energy system Realizing asphalt collector bus slope, ca 240 m2
			Realizing asphalt collector Loper Ahoy, ca 150 m2
Total	520,400		
17. RET*	Cost (€)	Justification	
Travel	7,400	Travel costs for project related meeting	gs
Other goods and	3,000	Audit costs	
services			
Equipment	210,000	Costs for ICT planning software (R7)	
Total	220,400		
18. ENE	Cost (€)	Justification	
Total	7,400	Travel costs for project related meeting	ls
10 KDN*	(f)	lustification	
Travel	7 400	Travel costs for project related meeting	25
Other goods and services	3,000	Audit costs	
Equipment	140,000	140.000 for material for building the da	ata hub (R10)
		LoRa	
		description	quantity prize total
		gateway	4 € 10.000,00 € 40.000,00
		kabels	1 € 2.000.00 € 2.000.00
		licences*	3 € 4,000,00 € 12,000,00
			£ 54,000,00
			€ 54.000,00
		Data Hub	
		description	quantity prize total
		base building blocks	1 € 50.000.00 € 50.000.00
		licence*	1 € 10,000,00 € 10,000,00
		security test environment	1 £ 15,000,00 £ 15,000,00
		redundant fiber connection and	1 £ 11.000.00 £ 11.000.00
		redundant liber connection aas	1 € 11.000,00 € 11.000,00
			€ 86.000,00
		*the licenses will be project specific (pa	€ 140.000,00 The four section of the section of th
		be displayed on each bill)	and project humber will
Total	150,400		
20. AHAB*	Cost (€)	Justification	
Travel	8,325	Travel costs for project related meeting	gs
Other goods and	215,000	Audit costs	
services		Sensors, ICT, controls (U2)21 000, sens	sors and controls in apartments (U4)
		63000 + air control 59000, central mon	http://www.storage.gov/app/14000 (U4)
Total)))))E	mistaliation ici tool, sensors, PVS with t	uallery storage & charging (U6)55000
21. VCC*	223,323 (nst (£)	Justification	
Travel	8.325	Travel costs for project related meeting	25
Other goods and	3,000	Audit costs	- -
services	,		
Equipment	32,700	WP3: 32,700 for E-charging hub (U6)	
Total	44,025		

22. UEAB	Cost (€)	Justification						
Travel	8,325	Travel costs for project relat	ted meetings					
Other goods and	18,000	ICT control, platform and lic	ence (U2)					
services								
Total	26,325							
23. UPAB	Cost (€)	Justification						
Travel	11,325	Travel costs for project relat	ted meetings					
Total	11,325							
24. TS	Cost (€)	Justification						
Travel	10,400	Travel costs for project relat	Travel costs for project related meetings					
Total	10,400							
25. SPPS*	Cost (€)	Justification						
Travel	10,400	Travel costs for project relat	ted meetings					
Total	10,400							
26. TCB*	Cost (€)	Justification						
Travel	10,400	Travel costs for project relat	ted meetings					
Total	10,400							
27. SIE*	Cost (€)	Justification						
Travel	7,400	Travel costs for project relat	ted meetings					
Other goods and	3,000	Audit costs						
services	10.400							
lotal	10,400							
28. PIC	Cost (€)	Justification						
Travel	6,901	Travel costs for project related meetings of which 7090 for travel in WP7						
lotal	6,901							
29. UNK	Lost (€)	Justification	a di sa a stila sa					
I ravel	18,500	Audit agets 2 000	ted meetings					
Other goods and	23,000	Audit costs: 3.000	voiast place and F		10 000 - 62	0.000		
Total	41 EOO	Project management tools P		U-FIN (2X €	.10,000 – €2	.0,000)		
	41,500	lustification						
	6 001	Travel costs for project relat	ad montings of wh	ich 7000 f	or troval in V	A/D7		
Total	6 901		ted meetings of wi	1011709010				
31. FI*	Cost (£)	lustification						
Travel	7,400	Travel costs for project relat	ed meetings					
Other goods and	100.000	WP2: for 3-D City operation	s model (R9):					
services								
		Clearly Dashboard 3D technology		Per year	5 years			
			License*	€ 12.000,00	€ 60.000,00			
			Security	€ 2.500,00	€ 12.500,00			
			Servers Infrastructure	€ 5.500,00	€ 27.500,00			
			Total		€ 100.000,00			
		*the license is project speci	fic (name 'Ruggedi	sed' and pi	roject numb	er will be		
		displayed on each bill)						
Total	107,400							
32. WG	Cost (€)	Justification						
Travel	8,325	Travel costs for project relat	ted meetings					
Other goods and	44,068	WP4: for the purchase of do	omestic storage & d	control equ	ipment for	demand-		
services		side management						
Total	51,468							
33. GIWK	Cost (€)	Justification						
Travel	6,901	Travel costs for project relat	ted meetings of wh	ich 7090 fo	or travel in V	VP7		
Total	6,901							

34. SI	Cost (€)	Justification
Travel	5,550	Travel costs for project related national meetings
Total	5,550	

The table below reports the overview of the travels planned within the RUGGEDISED project.

Type of meeting	Meeting intervals	Members (chair)	Tasks	Related to
General Assembly (GA)	Every 6 months	All project partners (Coordinator)	Share experience and update on project situation. Participation at project events	Governance bodies
Steering group (SG)	Every month via teleconferencing, and in person if necessary	Project management group, city governance group and WP leaders (Coordinator)	Project decision-making body	Governance bodies
Project Management group (PMG)	With Steering group meetings + teleconferences	Project Coordinator, Project Manager and Innovation Manager	Keep track of monthly progress, preparation of changes to the project in terms of innovation goals, finances, quality, risk management, dissemination and exploitation	Governance bodies
City Governances group (CGG)	At least twice per year	Lighthouse and Follower Cities (Coordinator). For the follower cities these meetings coincide with those outlined in WP7.	Ensure that all local project activities proceed according to plans	Governance bodies
Advisory Board (AB)	Once per year (combined with GA meeting)	External Smart City Experts, Project Coordinator (Innovation Manager)	Provide scientific and technical advice on select project activities and outputs of strategic importance	Governance bodies
Technical meetings with Lighthouse cities	To be held in combination with the GA	Lighthouses cities	To ensure that measures will be implemented in a coherent way among the lighthouse cities	WP1, task 1.1
Liaison Groups meetings	Twice per year (To be held in combination with the GA)	Members of lighthouse cities	Discuss progresses and opportunities for the different sectors	WP1, task 1.2
Workshop for the 3 lighthouse cities (factors most relevant to the up scaled deployment)	At M12 (back-to- back to the GA in M12).	Lighthouses cities	This workshop will be the forum for the analysis of the landscape-factors, trends and drivers. The output of this workshop will be qualitative data on major factors of influence to the smart solutions.	WP6 , task 6.3
Workshop for determining 'narrative scenarios'	At M18	AIT, SP, TNO, ROT, GCC, UME, US and one or two experts from each lighthouse city only.	Outputs from this workshop are first draft of narrative scenarios.	WP6 , task 6.3
6 Replication Workshops	Combined with GA	Lighthouse, WP1,5 and WP6, Follower cities	These workshops will define the possible replication actions for the follower cities.	WP7, task 7.1
6 Governing group meetings in the follower cities	To be held in the follower cities	Follower cities	These workshops will supervise the entire replication process ensuring overall coordination to the city governance.	WP7, task 7.2
Study Tours to the lighthouse cities	To be held in the lighthouse cities.	Lighthouse and Follower cities	One study visit of the follower cities in each of the lighthouse city (two, three days)	WP 7 task 7.1

Study tour to Portland		Open to lighthouse and follower cities	One visit in the USA city of Portland	WP 7 task 7.1
Coordination meeting for the organization of the Governance workshops	These actions will be performed from M7 to M39	Follower cities, ISINNOVA, AIT and PICTEC	A specific workshop will be held in which AIT, ISINNOVA and PICTEC will come together to share and fine-tune a common conceptual framework.	WP7, task 7.3
SCC1 events	Combined with conferences/events related to SCC initiatives	All interested partners	Knowledge exchange and discussion with other SCC1 consortia	WP8, task 8.2
European workshops	Combined with other SCC1 events	All interested partners	Reach a greater number and a greater variety of stakeholders.	WP9
Study tours to the lighthouse cities	To be held in the lighthouse cities	Lighthouse cities and City Interest Group	One study visit of the City Interest Group in each lighthouse city (one day)	WP9 task 9.4

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Section 4 Partner descriptions

4 Partner description 4.1 Individual consortium members Partner 1: City of Rotterdam (ROT) www.rotterdam.nl



The city of Rotterdam has some 630.000 inhabitants. The local government with nearly 11.000 employees arranges all kinds of public tasks. The construction, design and maintenance of public space like roads, dikes, bridges, lighting and so on is an important task of the city of Rotterdam. Besides that, the city has also involvement through urban development which makes investments in public space, houses, offices, cultural buildings and so on possible. Of course the city of Rotterdam has also huge social tasks like the organization for example of education, social welfare and sports facilities. The wellbeing of its citizens therefore is a major concern of the city of Rotterdam.

The main task of the city of Rotterdam in this SCC-call is to manage the international RUGGEDISED consortium by being the coordinating lead-city. Besides this international coordination, of course, Rotterdam will also manage his own Rotterdam Lighthouse-project. And within this project, the city of Rotterdam itself is responsible for several activities. The renovation of the public space with smart lighting, smart waste management, the development of the 3D-city operations model and the installation of e-car charging stations are some of the main activities.

The City of Rotterdam is one of the founding fathers of the Rotterdam Climate Initiative (RCI). RCI is a joint cooperation between the Port of Rotterdam, the City of Rotterdam, employers' organisation Deltalings, and the environmental protection agency DCMR. The mission of the initiators is improving the climate for the benefit of people, environment and the economy. The Rotterdam Climate Initiative offers a platform for government, organizations, companies and citizens to work on 50% reduction of CO2 emissions in 2025 compared to the 1990 level and 100% Climate Proof in 2025, while at the same time promoting the economy. This programme of Sustainability and climate change has its base within the Urban Development department. For the SSC1-call a highly skilled and experienced staff is recruited within this department which will manage both the international consortium as well as the Rotterdam lighthouse project itself.

CVs of involved key researchers/staff members

Albert Engels: Project manager (M)

Relevant work experience relevant to RUGGEDISED:

Albert Engels holds a MSC in real estate (civil engineering) at Delft University of Technology. He has been working for almost 20 years at several private consultancy agencies to advise/coordinate very big multidisciplinary building projects within consortia / (inter)national companies. After this private experience he moved to the project management and engineering department of the City development of Rotterdam in 2008. Since then he used his specific public and private managing experience in several physic projects in which collaboration with numerous private and public partners was involved. The last years he is committed as a process manager to EU-funded projects within the city of Rotterdam. He works for the City of Rotterdam as a senior technical project manager with also a strong focus on process management. Bringing and keeping parties together is one of his specialties.

Cleo Pouw: Project manager (F)

Relevant work experience relevant to RUGGEDISED:

Cleo Pouw holds a MSc in Business Administration from the Erasmus University Rotterdam. Being an inventive and pragmatic European project manager for the City of Rotterdam she has over 15 years' experience in the coordination and implementation of multi-partner European projects. She has been working as lead partner / project manager of CIVITAS - TELLUS (2002-2006), URBACT I –Securcity (2004-2006), URBACT II - My Generation (2008-2011) and My Generation at Work (2012-2015), Interreg IVB- MUSIC project (2010-2015) on CO2 reduction in the built environment. Furthermore she is involved in market outreach work of the Smart Cities

project CELSIUS on district heating and cooling (2013-2017) and as a financial manager for the Smart Cities project CityKeys (2015-2017), developing a common performance measurement framework. She also functions as an advisor for colleagues involved in the H2020 projects SPP Regions on innovative procurement and ESPRESSO (2016-2017) on the development of system standards for smart cities and communities solutions.

Hans Verdonk: EU-Coordinator of the city of Rotterdam (M)

Relevant work experience relevant to RUGGEDISED:

Hans Verdonk holds an MBA from Erasmus University Rotterdam and has been working for 20 years in the City's Urban development unit on European Affairs and from city Hall as the city's representative in Brussels especially focusing on sustainability and energy policies, urban development, and urban and regional policy. He was closely involved in setting up the CELCIUS programme under the first Smart Cities Call and was the consortium manager in setting up the Operational Programmes for the ERDF in the West Netherlands (for which the city of Rotterdam is the managing authority) for the period 2007-2013 and recently approved 2014-2020 programme period.

Dion Cools: Policy Coordinator (M)

Relevant work experience relevant to RUGGEDISED:

Dion Cools holds a MSc in Economics from the University of Tilburg. After his education he started as a policy coordinator. He has been working for 15 years at cityhall to support several elderman and the mayor of the city of Rotterdam. Mainly with a policy focus on city development, public space and public transport. After this experience he moved to the department of City development where as a manager he coordinated for 5 years the policy on the social real estate of the city of Rotterdam. The knowledge and experience on both policy and management processes and on (social) real estate developments, will be very useful in coordinating the local Rotterdam SCC-1 consortium.

Hendrik-Jan Bosch: Policy Coordinator (M)

Relevant work experience relevant to RUGGEDISED:

Hendrik-Jan Bosch holds a MSc in Earth Sciences from the University of Utrecht. After working as a researcher in the field of organic geochemistry/paleoclimatology, he started to work for the City of Rotterdam in 2001. He is a senior policy coordinator and strategist and is responsible for coordination of European projects within the Municipality of Rotterdam, for the Rotterdam part of the ERDF operational programme Kansen voor West 2 and for the integrated territorial investment programme Rotterdam-Zuid. He was responsible for setting up the current climate and energy action plan, the Rotterdam programme on Sustainability and Climate change 2011-2014. He coordinates the EU dimension for the Municipal and Regional Roadmap Next Economy that will form the basis for the new regional economic and smart city policies. Hendrik-Jan was involved in formulating the MUSIC and URBACT Resilient Europe projects and in the partnership of Rotterdam in the CELSIUS-project.

Relevant publications, and/or products, services or other achievements

Rotterdam can be considered as a frontrunner in 'Energy planning' and has developed the Rotterdam Energy Approach and Planning (REAP1 and 2) which incorporates CO2 and energy directly into the planning and development process. Rotterdam is an active member in different European and worldwide networks: Clinton Climate Initiative C40, Covenant of Mayors, EUROCITIES, METREX, ICLEI, Connecting Deltacities, World Ports Climate Initiative. The Urban Development department has long term and extensive experience as a co-ordinator in Interreg IVB/ MUSIC, CIVITAS/TELLUS and the URBACT/My Generation projects.

List of relevant previous projects or activities, connected to the subject of this proposal

TRANSFORM (2012-2015) TRANSFORM is a project dedicated to the mobilisation of the procurement power of city authorities and major companies, with the aim to accelerate progress towards sustainable zero carbon transport systems.

Relevance: The development of procurement of innovation strategies on realizing Green Transport

- The results will be used to bridge the gap with R&D, specifically the European Research Area (ERA) R&D
- An analysis of the impact of transport on climate change
- A sensible action plan to enable cities to make progress on smart, green integrated transport. An important
 part of the action plan is the potential synergies between public and private demand

CELSIUS (2013-2017) CELSIUS (Combined Efficient Large-Scale Integrated Urban Systems) demonstrates and promotes integration of smart district heating and smart district cooling.

<u>Relevance:</u> CELSIUS supports committed European cities to maximize the utilization of its primary and secondary energy resources in an integrated way that minimizes its operational costs and carbon emissions while maximizing its energy efficiency. The CELSIUS project will support EU's aspiring 20-20-20 goals

MUSIC (2010-2015) -MUSIC (Mitigation in Urban areas: Solutions for Innovative Cities) is a cooperation project between European cities and research institutes in Northwest Europe.

<u>Relevance:</u> MUSIC aims to reduce CO2 emissions with 50% in the partner cities Aberdeen, Montreuil, Gent, Ludwigsburg and Rotterdam in 2030. Besides these five cities, the research institutes the Dutch Research Institute For Transitions (DRIFT) and Public Research Centre Henri Tudor (Luxembourg) are partners in the project. In MUSIC, all cities will go through a transition process aiming to make CO2 reduction an integral part of urban planning processes.

NeZeR (2014-2017) -NeZeR project promotes the implementation and smart integration of Nearly Zero Energy Building Renovation (NZEBR) measures and the deployment of Renewable Energy Resources (RES) in the European renovation market.

<u>Relevance</u>: NeZeR will analyse technical solutions for Nearly Zero Energy Building Renovation, NZEBR, based on their ability to reduce the energy use of the buildings and to integrate RES, and combine them to packaged solutions. Successfully executed NZEBR cases will be analysed to identify technical barriers in NZEBR implementation

RAINGAIN (2010-2015) RAINGAIN is a transnational project aimed at improving the prediction of pluvial floods in our cities.

<u>Relevance</u>: The frequency and the damages of pluvial floods in urban areas are expected to increase as a consequence of climate change and urban development. New solutions are needed to cope with intense storms and to reduce the risks for populations and infrastructures. RainGain develops and tests innovative tools and practices based on the use of high resolution radars in four pilot cities: Leuven, London, Paris and Rotterdam. The project is funded by the European programme Interreg IVB NEW.

Description of significant infrastructure and major items of technical equipment relevant to the project

No significant items to be planned.

Large Infra structure

	Cost (€)	Justification
Large research infrastructure		Not applicable

Partner 2: City of Umeå

(UME)

www/umea.se/kommun



The **city of Umeå** is the centre of growth in northern Sweden and 2015 passed 120 000 inhabitants.

The city will coordinate the local lighthouse city partnership in Umeå as well as coordinate some smart solutions within the local context. The city as such is one of the fastest growing cities in Europe, with a strong focus on research and development. It is also very active in several international networks, and currently holds political positions as first vice-President for the Union of Baltic cities and is a member of the CIVITAS Political Advisory committee. The businesses and especially the citizens of Umeå are famous for their active involvement in Umeå's sustainable development, confirmed in the 2014 European Smart City benchmarking by Vienna University of Technology ranking the Umeå citizens Europe's most environmentally aware citizens. They put pressure on the city to be progressive, bold and to put forward new green solutions.

The city of Umeå has been involved in and managed several national and international projects within the scope of this call during 2007-present time, ex. Green citizens of Europe (Life plus), Sustainable Ålidhem (Swedish Delegation for sustainable cities, awarded EU Sustainable energy awards – Living category 2013), Umeå as testbed for sustainable city solutions (Swedish Energy agency), Sustainable travel in the Umeå region (ERDF). Open testbed for energy-smart solutions (Vinnova), (M-SPICE, Monitoring-Sustainable and participatory initiatibes for cities in Europe, URBACT) etc. The municipal organisation has around 11 000 employees. Swedish municipalities have a great autonomy and the way they are organized differ in various ways. The municipalities are bound by law to provide public services as:

- social services
- the school system
- planning and building issues
- health and environmental protection
- waste management, refuse and street cleaning
- water and sewage
- emergency and rescue services
- contingency planning and safety
- chief guardian/public trustee services

Other services provided on a voluntary basis include:

- recreation and leisure activities
- cultural services
- energy operations, in Umeå a specific municipal energy counselling office supports the general public

Short CV of involved key researchers / staff

Carina Aschan (Female):

Role in the project: Project manager/local Lighthouse coordinator

Qualification: Master of Science in Business and Economics with specialization in Project Management Staff category: Project Manager

Short description of work experience, relevant to the proposal:

Project Manager European funded, Swedish and multi international projects, since 2003 - present.

- TEN-T: Biomethane for Growth and Competiveness 2013-2015
- InterReg: Bothnian Green Logistic Corridor 2011-2013
- Life+: Green Citizens of Europe 2010-2011
- EDRF: Sustainable Travel Umeå region, 2008-2010
- EDRF: Sustainable Robertsfors 2003-2006

Albert Edman (Male):

Role in the project: Strategic development officer/Coordination Qualification: M.Sc. Engineering Chemistry, Umeå University

B.Sc. Chemistry, Coastal Carolina University, USA

Staff category: Strategic development officer

Short description of work experience, <u>relevant to the proposal</u>: Previous coordination, City of Umeå, 2008-present:

- Head of Urban development, Umeå2014-European Capital of Culture, 2013-2015
- EU Coordinator, M-SPICE (URBACT), 2012
- Project coordinator, Sustainable Ålidhem, 2010-2012, awarded European Sustainable energy awards, 2013.
- Sustainable Umeå region, 2008-2010
- Project development officer, Swedish Council for Sustainable Development, 2005-2007

Johan Sandström (Male)

Role in the project: Energy- and climate co-ordinator

Qualification: M. Sc. Engineering Energy technology, Umeå University

Staff category: Energy- and climate co-ordinator

Short description of work experience, <u>relevant to the proposal</u>: Previous coordination, City of Umeå, 2008-present:

- Project co-ordinator for Life+ project Green citizens of Europe 2011-2015
- Project manager, energy action plan, City of Umeå 2010-2015
- Project manager, Green Umeå, 2010
- Energy and climate advisor, City of Umeå 2008-2010

Project manager, Climate coach, Sustainable transport for Östergötland county, Region Östergötland, 2007 – 2008.

Project manager, Climate investment programme, Katrineholm municipality. 2004-2007 Energy and climate advisor, Katrineholm municipality, 2003-2007

Isak Brändström (Male)

Role in the project: Coordinator Sustainable Urban Mobility

Qualification: BSc. Human Geography, Umeå University, 2013

Staff category: Strategic transport infrastructure officer

Short description of work experience, relevant to the proposal:

- Strategic transport infrastructure officer, City of Umeå, 2014-present
- Urban planner, City of Umeå, 2013

Relevant publications and/or products/service

Open data platform, <u>www.opennorth.se</u> , coordinated by the city of Umeå, will be made continuously available during and after the project and also further developed within the scope of this project.

Relevant previous projects

Project name	Funded by	Budget involved for your organisation	Dates (start/end)
Greencit – Green citizens of Europe	Life plus	€2.6M	2010-2015

The overall objective of GREENCIT is to demonstrate how environmental policy can be interpreted and implemented into concrete citizen-oriented actions, which motivate and help citizens to change their behaviour. Three specific settings have been selected:

individual apartments in residential areas; jointly used waste management areas in residential blocks and the intra-city-region mobility system.

Within these settings we will set up a number of actions, which aim to demonstrate methods and techniques that

inspire and motivate people to change their behaviour and become part of a process towards more sustainable city management policy and governance. The methods that will be used aim to optimize the combination of innovative technology and communication methods in an urban environment, and to demonstrate, test and evaluate how new technology and design together with new methods for communication can enhance environmentally friendly behaviour in different settings: individual flats in residential blocks, waste management in residential blocks and the intra-city transport system. New techniques and methods which can help to monitor individual behaviour and which at the same time also provides the individual with feedback that gives him/her motivation to act in a way that is of benefit for the environment, will be demonstrated.

Project name	Funded by	Budget involved for your organisation	Dates (start/end)
Sustainable Ålidhem	Swedish delegation for sustainable cities	€3.6 M	2010 - 2014

Sustainable Ålidhem is a unique pilot project for sustainable urban development which involves social, technological, environmental and economic changes. The biggest changes will be noticed at Matematikgränd and Geografigränd.

The overall project goal is to reduce energy consumption in the area, create areas that are safer and more pleasant, and transform Ålidhem into the sustainable district. Refurbishing of 405 apartments which will lead to a reduced energy consumption of 40–50 percent. 137 new apartments have been built on Geografigränd. They have an energy consumption of 65 kWh/sqm per year, which is about 50 percent less than what is demanded according to today's construction norm. A complex of photovoltaic cells that when finished will consist of more than 2800 sqm - one of the largest in Sweden which is estimated to produce about 280 000 kWh every year. A winter garden that during the ligter period of the year will get all its power through photovoltaic cells. New washing machines that are connected to the district heating system, which reduce the consumption of electricity. A display (Echolog) is installed in each apartment. It shows the consumption of electricity and hot and cold water.

Project name	Funded by	Budget involved for your organisation	Dates (start/end)
OpenNorth – regional Open Data Cluster	Swedish Energy agency	€ 500.000	2010 - 2013

Project Management/Coordination of the City of Umeå's activities regarding Open Data including the projects that designed and implemented the co-operation with the Municipality of Skellefteå, the university of Umeå and the university of Luleå regarding strategical, tactical and operational actions connected Open Data and Open Innovation.

The main activities were :

- Creating an Open Data strategy, including procurement standards opening up for the publishing of Open Data
- Implementation of a CKAN-site with supporting WordPress- and MediaWiki-sites:
- www.opennorth.se , opendata.opennorth.se , wiki.opennorth.se
- Creating routines/guidelines for publishing Open data from the city's system
- Creating programs/scripts for extracting and publish Open Data automatically
- Arranging Innovation seminars
- Creating Linked Open Data using semantic techniques

Large Infra structure

	Cost (€)	Justification
Large research infrastructure	0,00€	Not applicable

Partner 3: Glasgow City Council

(GCC)

SCC-1-2016

www.glasgow.gov.uk



With approximately 24,000 employees, the **Glasgow City Council** is the largest of Scotland's 32 local authorities, providing essential frontline and support services – including: schools, roads, libraries, planning, refuse collection and social care. The Council delivers all its services through 7 departments to Glasgow's 600,000 residents, while managing a gross annual budget of over £2.4 billion.

The Council has five strategic priorities; these are to make sure Glasgow has:

- Economic growth; and is
- A world class city
- A sustainable city
- A city that looks after its vulnerable people
- A learning city.

Glasgow is the largest city in Scotland accounting for 11.4% of the 5.25 million total population and is one of the largest cities in the UK with almost 1% of the UK population. Outside London, it is one of the largest concentrations of economic activity in the UK. The city alone generates 17% of Scotland's jobs and generates just under 18% of the value of goods and services produced in Scotland.

Glasgow is a city of contrasts - whilst it faces many well documented challenges in addressing deprivation, health and inequality, it is however an ambitious city which has been successful in attracting world class events, investment and business. It has made major investments in its civic, cultural and sporting infrastructure working with partners in the private, public and third sectors.

The city is committed to a long-term transformation of its economy and regeneration of former industrial and port areas and has fully embraced the concept of the 'smart city'. In 2009 Glasgow City Council (GCC) established Sustainable Glasgow, a platform bringing together all the key players from the public, private and academic sectors to help the city achieve its CO2 emissions reduction target of 30% by 2020 (from 2006/07 levels).

The city is also a signatory of the EU Covenant of Mayors and in 2010 the Sustainable Glasgow initiative created the basis of a Sustainable Energy Action Plan (SEAP) to map out Glasgow's route to sustainability.

In April 2014, Glasgow was named as one of the first members of the Rockefeller Foundation's 100 Resilient Cities Network. Glasgow's membership in the network represents a major step towards creating a strategic, multi-agency approach in proactively managing the inevitable challenges, shocks and stresses the city faces. In Glasgow, challenges include: ageing infrastructure; extreme weather such as storms and flooding caused by climate change; securing sustainable and affordable energy suppliers amid increasing pressure on the national grid and tackling social inequalities.

Glasgow City Council seeks to build on these approaches and strategies by coordinating work package 3 within RUGGEDISED.

CVs of involved key researchers / staff members

Gavin Slater (m) has an honors degree in Environmental Science & Environmental Management and is the City Energy and Carbon Manager for Glasgow City Council. He will be the Project Manager for WP3 in RUGGEDISED. As City Energy & Carbon Manager, Gavin is tasked with delivering the strategy for the new Energy Services Company for Glasgow whilst ensuring Glasgow City Council meets its Sustainable Glasgow carbon reduction targets and its obligations as part of the Strategies Towards Energy Performance in Urban Planning (STEP-UP) programme. He is also responsible for management of the Council's Carbon Management Team who manage the council's estate in relation to energy. In this project, Gavin will be responsible for ensuring that the project is in-line with the city's energy infrastructure development, and carbon reduction needs. **Ciaran Higgins (m**.) Has three master's degrees in Electronic & Electrical engineering, Sustainable Urban Design, & Renewable Energy Engineering Distributed Generation. Ciaran worked for 6 years as an electronic engineer after which he retrained to work in the energy sector as an electrical & energy engineer. Ciaran has worked for a renewable consultancy (as an electrical Technical advisor on wind farms); Glasgow City Council as the Carbon Manager (responsible for the energy management of the Council's estate); Scottish Power Energy Networks in their Cities Team (developing community-scale energy schemes and smart grid solutions); and latterly as an independent energy consultant, working on the development of community-scale energy projects primarily through GIS-based analysis. Key areas of expertise include: project development and management; GIS analysis; engineering; energy project development & modelling; and stakeholder engagement.

Relevant publications, and/or products, services or other achievements The Energy and Carbon Masterplan 2015 Glasgow City Council Carbon Management Plan 2015 Glasgow's Strategic Plan 2012-2017 Energy and Sustainability Task Group Report 2015 Future Cities – Glasgow Energy Demonstrator Projects

List of relevant previous projects or activities, connected to the subject of this proposal

Project acronym	Funding source/ period	Topic and website	Instrument
Future Cities Demonstrator	Innovate UK (Formerly Technology Strategy Board) 2013-2015	Series of Smart City projects to demonstrate Glasgow as a 'future city'. <u>http://futurecity.glasgow.gov.uk/</u>	Technology Demonstrator
STEP UP – Strategies Towards Energy Performance and Urban Planning	FP7 – Smart Cities 2012-2015	Enhancing SEAPs and developing innovative low carbon energy projects. http://stepupsmartcities.eu/	Collaborative Project

Description of significant infrastructure and major items of technical equipment relevant to the project Duke Street Car Park Glasgow City Chambers Street lighting

Building Management Systems in Glasgow City Chambers

Large Infra structure Not applicable

Partner 4: Sveriges tekniska forskningsinstitut

(SP)

www.sp.se



SP Sveriges Tekniska Forskningsinstitut AB (SP Technical Research Institute of Sweden AB) is the national institute for technical research, evaluation, testing, certification and calibration. SP works closely together with large and small companies, universities, institutes of technology and other organisations, linking research with industrial needs. The Institute has about 1400 employees of which 400 are researchers. SP is currently involved in over 100 EU funded projects.

SP has been very successful during the last years in participating in EU funded Smart Cities projects. The projects are carried out in close alliances with public and private actors in Sweden to foster innovation towards sustainable cities. SP is today participating in 4 Smart Cities projects of which it coordinates one; SINFONIA.

SP will be involved in the upscaling process of the Lighthouse projects. The role also involves engagement in the work of analysing and supporting the cities in their continuous involvement in these projects.

Staff profile

Håkan Perslow (Male)

Role in the project: Work package leader

Qualification: M.Sc. Staff category: Manager

Short description of work experience, <u>relevant to the proposal</u>: Håkan Perslow is working as coordinator of the FP7 project SINFONIA. He holds a Master of European Politics and has 15 years' experience in EU –policy and projects. In his previous position in the City of Gothenburg, he worked with EU funded projects, e.g. INTERREG, FP7 and IEE- STEER projects. Håkan is also working within the consortium supporting the Smart Cities Marketplace.

Jesse Fahnestock (Male)

Role in the project: Scenario analysis

Qualification: M.Sc.

Staff category: Researcher

Short description of work experience, <u>relevant to the proposal</u>: Jesse Fahnestock is a Senior Project Manager working on foresight and policy analysis related to clean energy and sustainability. His background is in energy and climate policy in an industry context and socio-economic dimensions of risk. He is the co-author of

- A One Tonne Future: A Guide to the Low-Carbon Century (Vattenfall 2009);
- Driving Technological Innovation for a Low-Carbon Society (Stockholm Environment Institute 2012);
- Global Risks (World Economic Forum, 2006-2008) as well
- as numerous policy white papers on climate and energy policy. He leads SP's engagement in RECREATE, GREEN.eu and AERTOS Bio-Based Economy.

Inger-Lise Svensson (Female)

Role in the project: Energy systems analysis research specialist WP 6, local evaluation coordinator for Umeå Qualification: PhD

Staff category: Researcher

Short description of work experience, <u>relevant to the proposal:</u> Inger-Lise Svensson (PhD) is a researcher in energy systems and her research areas include integrated energy systems, urban energy systems and the connection between industrial and urban energy systems. Inger-Lise has previously worked for the City of Gothenburg and has been involved in in a number of international and national projects concerning urban energy systems in both her current and previous work positions such as the FP7 funded projects STEP-UP and SINFONIA and the INTERREG project PRINCIP.

Kerstin Elias (Female)

Role in the project: Qualification: M.Sc. in Achitecture

Staff category: Researcher

Short description of work experience, <u>relevant to the proposal</u>: Kerstin Elias is currently working as head of urban development at SP and doing research on innovation and governance in Swedish cities. She has 10 years of experience of transdisciplinary research and of establishing collaborative research centras and innovation platforms which is part of enhancing Sweden's urban innovation capacity. She is currently a phd student at KTH the Royal Institute of Technology with the digitalization and housing supply in Stockholm as main case study.

Magnus Brolin (Male)

Role in the project: Energy systems analysis research specialist WP 6

Qualification: PhD

Staff category: Senior Researcher

Short description of work experience, <u>relevant to the proposal</u>: Magnus Brolin (PhD), senior researcher in energy systems, has over 10 years of experience from research within electric power systems, energy systems and energy markets. His current research interests includes energy systems integration, smart grids and the role of the demand side in the future energy system. Magnus has contributed with research and project management in several international projects, such as the IEA project "The role of Demand Side in Delivering Effective Smart Grids", and the FP7 funded projects S3C and STEP-UP. He is also a participant of the Swedish IEA ISGAN coordination and collaboration board, and is a member of the R&D reference group to the Swedish Smart Grid coordination board.
Project name	Short description	Funded by	BudgetSP	Year
STEP-UP	STEP UP is an energy and city planning programme that aims to assist cities enhance their sustainable energy action plans and integrate energy planning into their sustainable city planning. Twelve organisations is working with local government, research and commercial partners.	FP 7	€ 438 632	2012-2015
EU-Gugle	EU-GUGLE aims to demonstrate the feasibility of nearly- zero energy building renovation models in six pilot cities in view of triggering large-scale, Europe-wide replication in smart cities and communities by 2020.	FP7	€ 265840	2013-2018
CELSIUS	CELSIUS – Combined Efficient Large Scale Integrated Urban Systems. The main objective is to use primary and secondary energy flows within a city in order to increase the energy efficiency. By integrating effective systems for heat and cold, the use of primary energy sources will be maximized and enable the use of overflow heat supplies.	FP7	€ 870000	2013-2017
SINFONIA	Smart Cities-project, involving two demonstration cities and five early adopter cities. Demonstration projects on retrofitting, and energy efficient infrastructures. Research on scalability/replicability and energy system analysis	FP7	€ 2 959 000	2014-2019

Relevant previous projects

Description of significant infrastructure and major items of technical equipment relevant to the project No significant items to be planned

Large Infra structure Not applicable

Partner 5: Istituto di Studi per L'Integrazione dei Sistemi (ISINNOVA) www.isis-it.com



ISINNOVA - the Institute of Studies for the Integration of Systems (<u>www.isis-it.com</u>) is an independent research institute supporting international, national and local public bodies for the analysis, the design, the implementation and the evaluation of sustainable policies in the fields of transport and mobility, urban planning, energy, environment, and knowledge society.

For more than four decades ISINNOVA has supplied expertise and solved complex problems for a variety of public and private organisations, and notably for the European Commission. Founded in 1971, ISINNOVA employs a permanent staff of 20 experts, mainly engineers, statisticians and policy scientists, of which 15 are full Partners. The institute has its own capability to develop interactive and user-friendly software tools.

ISINNOVA has played an important role in the conception and implementation of some of the most significant projects carried out in Europe, participating, both as leader and as partner, in over 80 EU funded projects from FP4 to FP7, as well as other EU programmes such as IEE and Interreg. The FP7 Monitoring report 2012, ranks ISINNOVA 13° in Europe and 2° in Italy as SME with the highest numbers of participations in FP7 signed grant agreements during the period 2007-2012.

International and national research projects in which ISINNOVA has been part cover a wide range of issues related to energy, infrastructure and sustainable transport and mobility. The focus of these initiatives has primarily been on: energy efficiency in appliances, fleets of vehicles, buildings and smart grids, promotion of sustainable modes of transport, green public procurement, innovative ICT solutions applied to energy and mobility systems.

ISINNOVA has overtime coordinated a number of high-profile EU initiatives, in different sectors of relevance for the SCC Call. Noteworthy are projects such as NEEDS (66 EU partners evaluating the full costs and benefits of energy policies and of future energy systems, both at the level of individual countries and for the enlarged EU as a whole), CIVITAS MIMOSA and CIVITAS CATALIST (large EU partnerships of local authorities engage in innovative urban mobility solutions), STADIUM (large transnational partnership work in the EU, India and Brazil to improve the performance of transport services and systems made available for large events), URBACHINA (EU-China cooperation for a historical and comparative study contributing to guiding the urbanisation process in China over the next 40 years), and AWARE (large EU project assessing how to bridge the knowledge of citizens, scientists and policy makers for sustainable water ecosystems management in Europe).

ISINNOVA is also a respected expert in policy impact assessment, with particular reference to socio-economic impacts, including the development and application of forward looking analysis (FLA) methods and tools. Relevant is the expertise in assessing the environmental and social costs of energy production and consumption.

Relevant for this project are the following EU projects:

- Energy: i) support to the definition of policies and strategies for energy saving and rational use of energy (i.e. project ODYSSE-MURE2012); ii) assessment of environmental, economic and social impacts from the production and use of energy (i.e. project NEEDS); iii) energy efficiency and eco-labelling of household appliances (i.e. project ATLETE, ATLETE II, ECODESIGN Studies lots 12 & 13, several consultancies and studies for CECED); iv) strategic analysis of Energy policies (i.e. project RESHARE, E-GRIDS); v) development of pilot plans in the field of the heating and cooling with renewable energies (i.e. RES H/C SPREAD).
- Transport: Analysing the potential for wide scale roll out of integrated Smart Cities and Communities solutions, CIVITAS METEOR, CIVITAS CATALIST, CIVITAS MIMOSA, CIVITAS MODERN, CIVITAS CAPITAL, START, CARMA, BIOSURF, BIOMASTER.
- ICT: CITY MOBIL, CITY MOBIL II, STADIUM, ICARS, SMART 67, COMPASS, CONDUITS.
- Foresight: PASHMINA, FLAGSHIP.
- Participatory governance: RAISE, MOVE TOGETER, AWARE, PASSO.

ISINNOVA works in cooperation with an extensive and established network of leading international organisations, including governments, ministries, agencies, universities, public and private research and consulting firms in Europe and in the world. This network is conducive to effective dialogue with actors playing an important role in the process of participatory decision-making, such as public authorities, industrial and economic parties, and civil society representatives. Whether at the national or international level, ISINNOVA can facilitate exchanges with relevant players by organising conferences, workshops, surveys, or ad-hoc working groups and discussions.

 ISINNOVA is the leader of WP7, which supervises the replication of the smart solutions in the follower cities. It also holds relevant roles in the strictly related WP1, which establishes the project's innovation framework, and WP6, which ensures the sustainability of the long-term effects of the smart solutions implemented by the lighthouse cities. ISINNOVA also active in WP8, which liaises with the other SCC1 projects.

CVs of involved key researchers / staff members

Mario Gualdi (M) holds degrees in Political Science (LUISS University, Rome, Italy) and City and Regional Planning (Cornell University, Ithaca, New York, USA). Currently managing director of ISINNOVA, Mario has been involved in the development and management of several international projects focusing on innovative and sustainable urban mobility. He is particularly passionate about spatial planning, urban regeneration, walking and cycling. Notable research and development projects include CIVITAS METEOR, CIVITAS CATALIST, CIVITAS MIMOSA, START, ECOSTARS, COST 332 Action, TRANSLAND, TRANSPLUS, PLUME, MARETOPE, CUPID, CURACAO, SPICYCLES and CARMA. Mario has coordinated large international initiatives and is extensively involved in the assessment of socio-economic impacts of urban policies. He is author of a number of policy and technical publications. He is fluent in Italian and English.

Andrea Ricci (M) - ISINNOVA Vice President, Andrea joined ISINNOVA in 1981. He received his engineering degree at Ecole Centrale (Paris, France) in 1977. His key qualifications include: sustainability policy analysis and impact assessment, forward looking analysis, energy studies and information systems, transport studies and information systems. He participated and coordinated many EU RTD projects, among which: EFONET (FP7); NEEDS (FP6), FLAGSHIP, PASHMINA and URBACHINA. He served as evaluator of EU RTD proposals within FP4, FP5, FP6 and FP7, and he also contributed to the ex-post evaluation of several EU RTD Programmes (International Cooperation, Environment, Bioeconomy). Counting more than 100 international publications, he is also author of a number of EU reports (DG RTD) ("Assessing the Social and Environmental Impacts of European Research", "The overall socio-economic dimension of community research in the fifth European framework programme"). He has recently served as the Rapporteur of the EC Working Group "Global Europe 2030 – 2050". Fluent in Italian, English and French, He has also a very good knowledge of Spanish.

Stefano Faberi (M) - obtained a degree in Mechanical Engineering from the University of Rome "La Sapienza". He is currently Managing Director of ISINNOVA as well as consultant for the Italian Energy Agency (ENEA) in the field of the Regional Energy Planning. He has over 20 years of experience in Energy studies and information systems (Rational Use of Energy, Energy modelling, Energy planning) and Government and Corporate Planning (Energy, Environment, Transportation). He has also teaching experiences in CCE/NIS and Mediterranean countries where he held training sessions on energy saving and related energy themes (within the framework of the EEC SYNERGY and INCO-COPERNICUS programmes).

Relevant publications, and/or products, services or other achievements

- ODYSSE-MURE (2000-ongoing): two complementary internet databases, covering the 28 EU Member States, plus Norway, on i) energy efficiency / CO2 indicators and on data required for their calculation (energy use data and their socio-economic drivers), and ii) energy efficiency measures and their impact evaluation.
- CIVITAS in Europe a Proven Framework for Progress in Urban Mobility (2013): a publication reporting on the ability of the CIVITAS Initiative to identify, demonstrate and promote instruments that enable Europe to reach its sustainability objectives without overstepping legitimate political constraints.
- EFONET Country Reports on Energy Foresight (2010): an overview of European foresight cultures and dynamics to assist the European Commission in the formulation, review and evaluation of European energy strategies.

- Enabling Cycling Cities (2013): a handbook disseminated worldwide to public authorities interested in promoting sustainable urban mobility and boosting their cycling planning capabilities.
- Public Bicycles and other European Experiences (2010): a publication reflecting on the growth of urban cycling, which until recent times was not the "hot" mode of transport, focussing on key elements such as cycling planning, communication and awareness raising, the building of local partnerships, the explosion in popularity of public bicycle systems and e-bikes.

List of relevant previous projects or activities, connected to the subject of this proposal

Project acronym	Funding source/ period	Topic and website	Instrument
Biosurf	European Commission, Innovation and Networks Executive Agency/2015- 2017	BIOmethane as SUstainable and Renewable Fuel http://www.biosurf.eu/en_GB/	Horizon 2020
Analysing the potential for wide scale roll out of integrated Smart Cities and Communities solutions	European Commission – DG ENER, 2015	Analyse Smart City Solutions best practice examples in Europe and worldwide; Analyse European Smart City Solutions replication potential and support actions; Analyse Smart City Solutions best practices of business models	Tender
RES H/C SPREAD	European Commission, 2014 – 2016	The RES H/C SPREAD project aims to develop six pilot regional plans for heating and cooling from renewable energy. The project involves six pilot Regions pertaining to as many European countries representing the EU main climatic zones, with a prevalence of the Mediterranean nations. The planning exercise aims at setting harmonized and standard baselines to better allow the developers to set their targets and policies. <u>http://www.res-hc-spread.eu/en_GB</u>	IEE
Biomaster	European Commission, 2011 - 2014	BIOMethane as an Alternative Source for Transport and Energy Renaissance; <u>http://www.biomaster-project.eu/</u>	EACI
CIVITAS MIMOSA -	European Commission, DG TREN; 2008 - 2012	Making Innovation in Mobility and Sustainable Actions; http://civitas.eu/content/mimosa	FP7
CIVITAS CATALIST -	European Commission, DG MOVE; 2007-2012;	Transfer Action Leading to Innovation & Sustainable Transport; http://cordis.europa.eu/project/rcn/85681 it.html	FP7
BIOGASMAX	European Commission, 2006-2010	Biogas as vehicle fuel-Market Expansion to 2010 Air Quality; http://cordis.europa.eu/project/rcn/85619 en.html	FP6
NEEDS	European Commission; 2004-2009	New Energy Externalities Development for Sustainability; http://www.needs-project.org	FP6

Description of significant infrastructure and major items of technical equipment relevant to the project Not applicable

Large Infra structure Not applicable

Partner 6: Austrian Institute of Technology GmbH (AIT) www.ait.ac.at



The **AIT Austrian Institute of Technology**, Austria's largest non-university research institute, takes a leading position in the Austrian innovation system in the areas of Energy, Mobility, Health & Environment, Safety & Security as well as Innovation Systems and a key role in Europe as the RTO focusing on the key infrastructure topics of the future. More than 1100 employees - largely based at offices and laboratories in Vienna, Seibersdorf, Wr. Neustadt, Ranshofen, Graz and Leoben – work on the development of tools, technologies and solutions for Austrian industry considered to be of future relevance.

The **Energy Department**, one of five departments, favours a holistic approach to the environmentally friendly electricity supply, heating and climate control of the buildings and cities of tomorrow. Using sophisticated measurement technology and innovative simulation tools, interdisciplinary research teams combine decentralised energy producers, efficient distribution networks and smart buildings with efficient heating and cooling technologies to form a single, sustainable energy system.

The **Department Innovation Systems** is dedicated to support research and innovation processes and related policies in the context of regional, national and European Innovation Eco-Systems. In this proposal two Business Units will be involved: the **Business Unit Research, Technology & Innovation Policy** is frontrunner in the development and implementation of novel innovation management approaches (e.g. urban living labs), strategic foresight (e.g. for Smart City strategies), social network analysis of R&D collaborations. Particular emphasis is laid on long-term transition management and strategies in large socio-technical systems such as energy, transport and ICT. The **Business Unit Technology Experience** deals with User Experience and specific factors, that influence experiences derived from interaction with innovative technology, goods and services.

CVs of involved key researchers / staff members

Hans-Martin Neumann (male), Engineer and coordinator of the research group on Urban and Regional Energy Strategies at the AIT, Energy Department in Vienna. He holds a degree in Urban and Regional Planning (TU Berlin, 2001) and is an experienced researcher and project manager. Hans-Martin is involved as work package leader in the H2020 project CITYKEYS (GA no 646440) and other Smart Cities projects in the EU and in Asia, e.g. concept development of the first Sino-Austrian Eco-Business Park in Nantong, China. He is also actively involved in the Sherpa Group of the European Innovation Partnership on Smart Cities and Communities (EIP SCC) and the working group of the SET Plan Integrated Road Map. Before 2012, he worked as a research assistant for the Chair for Sustainable Spatial Development at the University of Liechtenstein. From 2001 to 2009 he worked as urban planning consultant in Berlin and Munich.

Dr. Florian Judex (male), Scientist at the AIT Energy Department since 2009, studied applied mathematics at the Vienna University of Technology, graduating with full honours as a Ph.D. in 2008. He works at the AIT as scientist and project manager, dealing with modelling and simulation of building energy systems and interaction of buildings and energy grids, as well as using optimization techniques in these two fields. Currently he is involved in European projects as FP7 EcoGridEU (GA no , FP7 EEPOS and acts as work package leader of the Austrian demonstration project Smart Cities Demo Aspern being responsible for scientific monitoring and the development of the evaluation methodology. As an applied mathematician, he is skilled in the theoretical foundations of his work as well as the implementation of concrete projects.

Dr Klaus Kubeczko (male) is senior expert advisor at the Innovation Systems Department. He has been leading projects at global, European, national and city level for more than 13 years and is experienced in managing large interdisciplinary consortia. He holds a doctorate in economics and social sciences. Prior to his carrier in R&D, he worked as electrical engineer in Europe, Asia and North Africa. His expertise covers research and innovation management and -policy issues as well as strategic foresight and deliberation with particular emphasis on grand societal challenges (e.g. climate change, energy transition) and sustainable network infrastructures (energy and

mobility). He was involved in several foresight processes that relate sectoral policy fields and new forms of RTIpolicies dealing with the substantial challenges that come with climate change (both adaptation and mitigation) and the transition of infrastructure networks (Smart Cities, E- Trans 2050, Freightvision 2050). He provided strategic advice to the Joint Programming Initiative Urban Europe in the formulation of its strategic research agenda based on the analysis of long-term trends in climate change, demography and urbanization. He is Operating Agent of Annex 7 on "Smart Grids Transitions" of the IEA - International Smart Grid Action Network (ISGAN) dealing with institutional change and foresight aspects of the transition of decentralised electricity systems.

Johann Schrammel (male), Scientist at AIT, studied education science, sociology and group dynamics, holds a Master degree in adult education from University of Graz and is a skilled trainer for team and organizational development, professionally trained in group dynamics with experience as group moderator. Johann is active in the field of Human Computer Interaction and User Experience Research for more than ten years and is the author of more than 50 peer-reviewed publications. He has successfully led numerous national and international research projects, focusing on different topics such as interacting with intelligent systems, information visualization, and persuasion and user experience.

Relevant publications, and/or products, services or other achievements

- Bres, A., Eder, K., Hauer, S., Judex, F. (2015) Case Study Of Energy Performance Analyses On Different Scales. Energy Procedia, Vol 68 (2015), S. 1847 - 1852.
- Carabias, V., Wilhelmer, D., Kubeczko, K., Edwards, F., Nelson, R. (2015) The importance of participatory foresight on the way towards smart cities; Futures; Special Issues. Forthcoming.
- Neumann, H.-M. (2014) Smart City Metrics; Outcomes of the EIP and recommendations given by the Sherpa Group, conference contribution at the event « Cities of Tomorrow - Investing in Europe » at DG Regio, Bruxelles
- Leal, S., Zucker, G., Hauer S., Judex, F. (2014) A Software Architecture for Simulation Support in Building Automation. Paper in Buildings 4(3), page 320-335
- Riegler, J., Kubeczko, K. and Loibl, W. (2013) JPI Urban Europe Urban Megatrends Study. Schrenk, M., Popovich, V.V., Zeile, P. and Elisei, P. (Eds.), REAL CORP 2013 Proceedings - 18th International Conference on Urban Planning and Regional Development in the Information Society GeoMultimedia 2013, May, 20th -23rd, Rome
- Gerdenitsch, C., Schrammel, J., Döbelt, S. and Tscheligi, M. (2011) Creating Persuasive Technologies for Sustainability – Identifying Barriers Limiting Target Behavior. in: Sixth International Conference on Persuasive Technology, Columbus, USA

List of relevant previous projects or activities, connected to the subject of this proposal

Project acronym	Funding source/ period	Topic and website	Instrument
SCIS	Contract no – ENER C2/2013- 463-SI2.691121 2014 – 2017	The Smart Cities Information System (SCIS) brings together project developers, cities, institutions, industry and experts from across Europe to exchange data, experience and know-how and to collaborate on the creation of smart cities and an energy- efficient urban environment. Launched with support from the European Commission, SCIS encompasses data collected from ongoing and future projects under the CONCERTO initiative and Smart Cities calls in Horizon 2020. With a focus on smart cities, energy efficiency, transport and mobility, and ICT, SCIS showcases solutions in the fields of sustainable building and district development, renewable energy sources for cities, energy efficiency and low-carbon technology applications. <u>http://smartcities-infosystem.eu/</u>	Service Contract
CITYKEYS	GA no. 646440 2015 - 2017	The mission of CITYKEYS is to develop, and validate, a holistic performance measurement framework for future harmonized and transparent monitoring and comparability of the European cities activities during the implementation of Smart City solutions. http://www.citykeys-project.eu/	H2020
Smarter Together	GA no. 691876 2016 - 2020	SMARTER TOGETHER's overarching vision is to find the right balance between smart technologies and organizational/ governance dimensions in order to deliver smart and inclusive solutions and to improve citizen's quality of life. SMARTER TOGETHER gather the European Lighthouse cities Lyon, Munich, Vienna, the Follower cities Santiago de Compostela, Sofia, Venice and Kyiv and Yokohama as observer cities bringing the perspective of East Europe and Asia. The cities are complemented by business partners from energy, mobility and ICT sectors, leading European research and academia organizations, european city network. From the various combinations of the different selected Light House areas, multiples opportunities to learn are offering.	H2020
SCDA Smart Cities Demo Aspern	2014 - 2017	The flagship project "SC Demo Aspern" intends a large-scale implementation of a system optimizing approach between buildings, power grids, users and comprehensive ICT solutions. This innovative combination is integrated into testbeds in the development area aspern Vienna's Urban Lakeside consisting of three construction sites. Findings from the demonstration are utilized to improve operation and control strategies of buildings and power grids as well as to innovate the interaction with users for optimal usage of energy and CO2 reductions. <u>http://www.ascr.at/en/grant-management/scda/</u>	National
TRANSFORM	GA no. ENER/ FP7EN/ 314396 2012 - 2015	Transform tries to investigate on possibilities to drastically reduce CO2 emissions in cities, in order to realize the local and EU targets; 20% lower carbon emissions, 20% of energy from renewables and 20% increase in energy efficiency. More specific is TRANSFORM about finding the barriers to reach these 20-20-20 targets and enables cities to transform to low carbon cities. http://urbantransform.eu/	FP7

Description of significant infrastructure and major items of technical equipment relevant to the project

The AIT Energy Department provides highly specialised infrastructure in the field of simulation and measurement. For thermal and dynamic building and facility simulation AIT's experts use software tool, such as TRNSYS, EnergyPlus and Modelica/Dymola based modeling. The analyses include modelling of buildings and systems as well as development and validation of new concepts. Furthermore, mathematical software tools (e.g. MATLAB) are used intensively. AIT's experts are regularly attending internal and external trainings to keep up to date with the newest developments of these software tools.

In order to enable high-quality user-centered research, AIT will be supported by its Technology Experience laboratory (TX.lab). The TX.lab is equipped with a smart home lab with various mobile and stationary eye-tracking devices, hardware and software UI prototyping kits. Furthermore, online surveying tools, as well as field testing equipment are also available, supporting smartphone-based experience sampling.

Large Infra structure - Justification

The infrastructure provides a state-of-the-art framework for conducting, documenting and analysing requirements engineering, focus groups, workshops, usability studies, user experience studies and quality of experience (QoE) studies. Those setups can take place either at dedicated rooms at the lab premises or can take place in a variety of contexts by utilizing mobile lab infrastructure. For running setups a dedicated Technology Experience Laboratory which is in its fixed place will be used. For running in-situ setups a mobile lab infrastructure will be used - Mobile Technology Experience Lab.

Moreover the infrastructure will provide a state-of-the-art framework for prototyping advanced interaction designs and future concepts. It will provide possibilities for a wide range of scenarios, ranging from simple, low fidelity paper mockups, via clickable prototypes to fully functional, high fidelity hard- and software prototypes.

The costs for the large research infrastructure are calculated on the base of the current cost accounting methodology. An ex-ante assessment as well as the official certification procedure by the European Commission finished recently, therefore AIT is fully entitled to claim those costs fulfilling all mandatory preconditions as defined in the Annotated Grant Agreement.

Partner 7: TNO - The Netherlands



(TNO)

www.tno.nl

TNO (Nederlandse Organisatie voor toegepast-natuurwetenschappelijk Onderzoek TNO) is one of the major contract research organisations in Europe. With a staff of approximately 3000 and an annual turnover of 580 million Euros, TNO is carrying out research in order to achieve impact on the following seven themes: Healthy Living, Industrial Innovation, Urbanisation, Energy, and Defence, Safety and Security.

TNO functions as an intermediary between basic research organisations and industry. By translating scientific knowledge into practical applications, TNO contributes to the innovation capacity of businesses and government. TNO is involved in many international projects (about 30% of the market turnover), including EU-funded collaborations.

In the theme *Urbanisation* applied research is carried out for related to solutions for liveable and competitive cities. This is done together with collaboration partners, governments and industry. Collectively we are applying our knowledge to improve the physical environment and make it sustainable. Our focus is on solutions in the fields of mobility, infrastructure and buildings, spatial planning and the environment. TNO Urbanisation works on four strategic roadmaps:

Smart Cities. This roadmap focusses on the topics low energy districts, clean mobility and logistics, and ICT in addition to national and international roadmaps on health and ageing. Our mission is to accelerate investment and the rate of innovation in cities in the Netherlands and in other urban regions with the aim of achieving social, economic and environmental objectives.

Apart from the smart city theme within Urbanisation, the following topics are also addressed:

Mobility and Logistics: solutions to significantly improve transport efficiency, safety and reduction of (Green House Gas) emissions in the transport system by developing new high impact concepts and building partnerships accelerate their market introduction.

Environment & Sustainability: create innovations that preserve and foster a healthy and safe urban environment, deal with climate change, and enable the transition from a linear towards a circular economy. We develop data driven models, products and services to build a resilient society which minimizes the use of natural resources and maximizes the reuse of waste and where environmentally-related health risks are pro-actively avoided.

Buildings and Infrastructures: keep the reliability and quality of the existing installed base of homes, hospitals, schools and infrastructure at the required level against reasonable cost; and to make our buildings and infrastructures sustainable in the sense that in the long run no more fossil energy is required for heating and other uses and building materials are recycled and/or made from sustainable materials.

Furthermore, RUGGEDISED will also call upon the theme *Energy* within TNO. In this theme applied research is carried out for innovations geared to making energy available on the basis of energy efficiency, energy storage, more optimal exploration of existing sources and making sustainable energy sources profitable. The *energy systems* knowledge of this theme is needed for the RUGGEDISED project.

In RUGGEDISED TNO will be leading work package 1 and will participate to WP 4, 5, 6, 7, 8 and 9. TNO will provide its knowledge on technical and process aspects of low energy districts, integrated infrastructures, sustainable urban mobility and logistics, and ICT to the consortium, in particular to the lighthouse project of the City of Rotterdam.

CVs of involved key researchers / staff members

Adriaan Slob (m) is working as senior scientist at TNO's Strategy and Policy department. He is involved in the theme Energy as a strategic advisor and also involved in the research program on smart cities of TNO. His specific interests are on the role of knowledge in policy making, the integration of knowledge via interdisciplinary and transdisciplinary processes, stakeholder involvement, and the use of methods and tools to facilitate knowledge sharing and joint implementation in these policy processes. He is well trained as a facilitator of stakeholder processes. He has extensive experience in EU-projects, both as WP-leader (AquaTerra, Desire, ARCH, etc.) and project coordinator (PSI-connect, Brainpool).

SCC-1-2016

For one day per week, he is visiting Associate professor in the competence group "governance of complex systems" at the Department of Public Administration, Erasmus University Rotterdam.

Alexander Woestenburg (m) (MSc) studied Spatial Planning and is currently finalizing his PdH research on the interaction of municipal land use instruments and the setting and demarcation of local spatial planning goals. Alexander is a scientist innovator at TNO and works on projects that aim to increase spatial and societal embeddedness of technological innovations and solutions. He contributed to various smart city projects, searching ways to overcome the governance challenges of an increasing technological penetration in the urban domain. Moreover he worked on the development of a multi-actor investment strategy for renewable energy investments (MAFMETIS). This methodology is currently being applied in several cities that aim for innovative smart urban developments, relying on the integration of multiple business cases.

Vincent Kamphuis (m) has been educated as a climate physicist and currently works as a researcher in the fields of sustainable energy and climate adaptation. He works on several models and tools which support the development of multi-stakeholder strategies towards low carbon, climate resilient cities, in close collaboration with the stakeholders involved. In his first two years at TNO, he worked in the fields of air quality and smart energy grids. The HeatMatcher algorithm he co-developed is currently being used in practice, making an efficient match between demand and supply of sustainable heat.

Mark Bolech (m) holds a D.Sc. in chemistry from University of Amsterdam. He has more than 25 years of experience in research and development, in profit-oriented enterprises such as KEMA, Philips and TNO. Since mid-2007 he has been working at TNO, first in Materials Technology, next in Sustainable Transport, and since early 2015 in department Climate, Air and Sustainability. Most of his expertise is related to materials science, physical chemistry and chemical thermodynamics. In-depth knowledge in the fields of thermodynamics, high temperature materials science, ceramic technology, PV technology, electrochemistry and power electronics. Over the last six years at TNO, he has been concentrating on electrical energy provision and storage systems (such as batteries or capacitors) in applications such as buses, trains and boats. In his latest role he is using his knowledge and experience in research aimed at increasing energy efficiency and planning and realising more sustainable power generation as well as buffering capabilities to accommodate more intermittent energy.

Sophie Jongeneel (f) has been educated as an environmental and energy scientist and is a researcher who works on the intersection of energy and spatial planning processes. One of her previous jobs was at the Netherlands Ministry of Housing, Spatial Planning and the Environment, working on the spatial planning consequences of the energy transition (from broad quickscans on the energy systems level, to detailed spatial policy on wind energy). Within TNO, she has (among others) continued to work in this field where energy and spatial planning processes meet, zooming in on the built environment. Projects for example include providing strategic decision support on the trade-offs (sustainable, affordable, reliable) between energy-efficient renovation and district heating for key stakeholders in the transition towards low-carbon cities.

Joost Laarakkers (m) (MSc) studied electrical engineering at Eindhoven University of Technology, and has over 20 years of experience in complex hardware and software systems in the electronics industry. He managed since 2009 the group Power Systems and Information Technology at the Dutch Energy Research Centre while working on Smart Grids technology. Currently he is senior business consultant at TNO, managing and overseeing several projects in the area of Smart Grids and Smart Cities with special focus on renewable energy, electric vehicle integration and standardisation.

Bas Kotterink (m) (MSc) is senior scientist specialist ICT Policy. He brings 20 years research and programme management experience working in the field of innovation management, ICT Policy and International Cooperation . The impact of digital platforms, web entrepreneurship, Open Innovation and Open Data are core themes in his work. He led a high level EU project on the Impact of Open Platforms and Web entrepreneurs on the EU Internet Economy. Currently, Bas is involved in the Future Internet PPP eHealth accelerator programme FICHe, challenging European SMEs and web entrepreneurs to develop successful applications and businesses Future Internet (FI-STAR and FI-WARE) technology in the eHealth market. Since 2013, Bas is mentor for leading accelerator Startupbootcamp Amsterdam, advising a wide variety of digital entrepreneurs.

Edwin Matthijssen (m) (MSc) obtained his master's degree in Electrical Engineering in 2002. Since then he has been working in various roles (architect, developer, consultant, project manager) in different sectors (space, agriculture, telecommunications, energy, health, defense). All projects were related to embedded systems and ICT. His main interests at the moment are Internet of Things, Smart Grids and Smart Cities. He has been involved in the Artemis ACCUS project since 2013, which develops an architecture for a Smart City Operation System, builds a reference implementation and demonstrates its functionalities including several smart city applications in the city of Gdansk. After the ACCUS project, Edwin participated in several other Smart Cities related projects in the Netherlands; In the Energy domain Edwin was (and still is) involved in several HeatMatcher projects, which is a technology that optimizes the use of sustainable energy sources in heating and cooling systems (residential and office buildings) and regional or urban heating networks.

Nienke Maas (f) (Msc) studied Civil Engineering, works as senior researcher and project manager in the field of low energy districts. She represented TNO in the Zero Energy Districts project, which developed tooling, roadmaps and business models with local governments, banks, energy supplier and network operators, and construction companies. She contributes to the EU Ecodistr-ICT project and Topsector project PICO, which both develops tools for dialogues and visioning with urban stakeholders, planners, consultants and industry on energy-efficient districts and buildings.

Mirjam Groote-Schaarsberg (f) (PhD) has a background in both Industrial Engineering and Management as well as Econometrics and Operations Research. She obtained her Ph.D. in Game Theory (and Operations Management) at Tilburg University. Since 2013 Mirjam has worked as a research scientist at the department of Strategic Business Analysis with a specialization in (bottom-up) energy transition modelling from interactive decision sciences and business perspective. She studied the changes in multi-actor value exchange that result from local energy production initiatives in the Netherlands, and she developed a process tool for facilitating multi-stakeholder investments in sustainable energy measures.

Relevant publications, and/or products, services or other achievements

- Bolech, M., Foster, D.L., De Lange, R. and C. Rodarius, (2010). Investigations of safety risks in converted electric vehicles. Proc. EVS 25, Shenzen.
- Bree, T. van, A. Slob, (forthcoming). BRAINPOOL: Knowledge brokerage for bringing alternative indicators into policy, in: André Martinuzzi and Michal Sedlacko, Knowledge Brokerage for Sustainable Development, Innovative Tools for Increasing Research Impact and Evidence-Based Policy Making. Greenleaf Publishing.
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- Manville, C., Cochrane, G., Cave, J., Millard, J., Pederson, J.K., Thaarup, R.K., Liebe, A., Wissner, M., Massink, R.A. & Kotterink, B. (2014). Mapping smart cities in the EU Brussel: European Parliament; Directorate General for Internal Policies. Policy Department Economic and Scientific policy A.
- OECD. (2015). Data-Driven Innovation: Big Data for Growth and Well-Being. OECD Publishing: Paris. TNO coauthor. See http://oe.cd/bigdata.
- Shekhar, A., Prasanth, V., Bauer, P. and M. Bolech. (in press). Economic Viability Study of an On-Road Wireless Charging System with Generic Driving Range Estimation Method. Energy.
- Slob, A. & I. van Meerkerk (forthcoming). The integration of scientific knowledge for managing multiple pressures on coastal waters. Journal Integrated Environmental Assessment and Management. Wiley.
- Van Buuren, A.W., J.M. Buijs, A.F.L. Slob (2010. Consolidating Governance Capacity in Complex Networks, Changing Perceptions, Relations and Institutions in Different Contexts. International Public Management Review, 2010, 11, 1, 34-512.
- HeatMatcher tool: Van Pruissen, O., Van der Togt, A. & Werkman, E., (2014). Energy Efficiency Comparison of a Centralized and a Multi-agent Market Based Heating System in a Field Test. In Robert J Howlett, ed. The 6th International Conference on Sustainability in Energy and Buildings, SEB-14. Cardiff, Wales, UK, 2014. Energy Procedia. 25 - 27 June 2014
- Verbeek, P.P. & A.F.L. Slob (eds.) (2006)., User behavior and technology development, shaping sustainable relations between consumers and technologies, ISBN 1-4020-4433-X, Springer Verlag.
- Veenstra A.F. van, Esmeijer, J., Bakker, T.P. & Kotterink, B. (2014). Data and the City Delft: TNO.

List of relevant previous projects or activities, connected to the subject of this proposal

Project acronym	Funding source/ period	Topic of the project / activities	Relevance and link to RUGGEDISED
ACCUS ARTEMIS	FP7 2013 - 2016	Integration and adaptive cooperative control across different urban systems. ACCUS aims at the development of a Platform for integrated urban systems. Urban subsystems consist of networked embedded systems that control functions of varying criticality (e.g., street lighting, traffic management). Direct access to internal sensing and actuation is therefore not sensible; instead, behaviour of a subsystem has to be controlled by policies, and control/data access is through services that admit semantic interoperability.	Outcomes can feed in RUGGEDISED: reference architecture for the integration of urban subsystems, designs of embedded technology for seamless and semantic integration and collaboration of urban subsystems according to this architecture as well as technology for defining converged applications, a semantic service abstraction and a policy abstraction to control subsystems, examples of control strategies for embedded and automated optimization of urban subsystems and a tool chain for engineering the actual integration of urban subsystems according to the reference architecture.
BrainPool	FP7 2011-2014	BRAINPOoL (www.brainpoolproject.eu) is a knowledge brokerage project aimed to understand what drives supply and demand of alternative indicators (or "Beyond GDP indicators") and to strengthen interaction and communication among scientists, statisticians, policy makers, NGOs, etc. in order to better connect these indicators to policy-making. Through action research in practical cases and a series of knowledge brokerage activities, partly with the same audience, the project has proven its worth in networking and community building that will ensure consolidation and follow-up beyond the duration of the project.	Brainpool delivered knowledge about the conditions that should be met to deliver indicators that will be used in policy making. These are related to the characteristics of the indicators themselves (technical, social, etc.) and their function (communication, signalling, monitoring). This knowledge can be used for the monitoring of the RUGGEDISED project. Furthermore, Brainpool delivered knowledge about knowledge brokerage between science and policy and instruments that can be used in RUGGEDISED.

CityKeys	H2020 DG-Energy 2015-2018	Development of a common framework for assessment of smart solutions, in particular of lighthouse projects and initiatives	Framework provides input to design and selection of KPI's, monitoring and evaluation methods in WP5 of RUGGEDISED, to assess progress of lighthouse projects
CIVITAS POINTER and CIVITAS WIKI	DG MOVE 2008-2012, 2012-2016	Between 2002 and 2011, over 800 ambitious, innovative transport measures and policies towards sustainable urban mobility have been tested by more than 50 European demonstration cities. CIVITAS POINTER and CIVITAS WIKI supported the monitoring and evaluation of the demonstration projects by disseminating best practices in monitoring and evaluation, and developing evaluation methodologies that can also be used in other cities and large-scale (EU) projects.	RUGGEDISED will build upon the practical guidelines for data collection and monitoring, and the transferable, common framework developed for ex-ante and ex-poste evaluation of solutions allowing validated comparison between measures implemented under different conditions in cities across Europe
Couperus	National funding	Smart Grids. This project assesses consumer involvement and Heat Pump smart grid optimization Powermatcher, see <u>https://www.stedin.net/over-</u> <u>stedin/projecten/couperus</u>	
Data-Driven Innovation	OECD 2015	'Data-Driven Innovation: Big Data for Growth and Well-Being' Paris. See also http://oe.cd/bigdata. TNO developed a case based chapter on developments in Data-driven innovation for this multi-year OECD project.	This high profile Study provides deep insights into the value propositions of Data Driven innovation. This is a key element in the RUGGEDISED proposal.
Ecodistr-ict	FP7 2014-2017	The aim of the Ecodistr-ict Project is to develop an integrated decision support system for sustainable neighbourhoods and to help different stakeholders for a collaborative decision while being transparent on ambitions and on effects of measures and interventions on different spatial and time scales. One of the case study was a district in Rotterdam where the IDSS support the network manager, housing association and city of Rotterdam. One of the conclusions was that sharing information resulted in a better situation for everyone.	The Ecodistri-ict project provides useful input for innovation framework and the EcoDistrict Planner, which will be tangible results of WP 1.
EcoGrid FP7 Smart Grids. The objective is to develop and demonstrate - on a largescale - a generally applicable real-time market concept for smart electricity distribution networks with high penetration of renewable energy sources and active user participation. It should thereby reduce		Knowledge will be used in the implementation framework WP 1 and the actual implementation of smart solutions in WP 4	

			the need for costly flexibility on the production side and/or compensate for traditional balancing power and services from conventional generation displaced by generation based on renewable energy sources" See <u>http://www.eu- ecogrid.net/</u>	
E-HUB FP7		FP7	The Energy Hub is a mechanism for exchanging energy via the grids between its members (households, renewable energy plants, offices, businesses), who may be both consumers and suppliers. The members are concerned with energy generation within the built environment, district heating, cooling and power, energy conversion and storage, and sharing energy resources. The members exchange information on their energy production and energy needs with the Energy Hub. The Hub then distributes the available energy in the most efficient way using an intranet of energy. Central to the E-Hub project is the <u>Multi</u> <u>Commodity Matcher</u> : this smart controller allocates energy dynamically to its most	Insights in data sharing will be used in the software part of the implementation framework of WP 1 and will be used throughout the entire project.
			demanding members from the most efficient sources of supply. Smart Energy see: <u>http://www.e-</u> <u>hub.org/index.html</u>	
	FosterREG	H2020 2015-2017	 FosterREG brings together national, regional and local public authorities involved in energy planning and urban regeneration. FosterREG builds up skills through collaborative work and capacity building activities with a especial focus on three aspects: integration of energy effiency measures in urban regeneration planning and implementation, engagement of stakeholders in the definition and implementation of solutions financial shemes and funding sources 	Specific knowledge on public and private capacity building will be involved throughout the entire RUGGEDISED project, regarding effective uptake of smart city solutions.
	Green eMotion	FP7 2011-2015	Project on the integration of sustainable energy and eMobility. Practical research was conducted in different demo regions all over Europe with the aim of developing and demonstrating a commonly accepted and user-friendly framework that combines interoperable and scalable technical solutions with a sustainable business platform. For the implementation of this framework, Green eMotion took into account smart grid developments, innovative ICT solutions, different types of EVs, as well as urban mobility concepts.See <u>http://www.greenemotion- project.eu/</u>	The knowledge developed on specific scalability issues will be very helpful for the implementation framework WP 1 and the translation of smart solutions and lessons learned to the follower cities and other EU cities.

HeatMatcher and IDEGO	EFRO (EU funding) and TKI (Dutch national funding) 2011-2016	Between 2011 and 2016, TNO participated in several national and EU funded projects relating supply demand matching in the heating and cooling domain. The HeatMatcher technology has been developed to optimize the use of renewable energy sources in heating and cooling systems and networks. The HeatMatcher is currently running on 4 different installations in the Netherlands and achieved savings of ~20% in fossil energy. The IDEGO project focusses on the integration of HeatMatcher and PowerMatcher to enable Hybrid Energy Matching. The integrated solution is currently being tested in one installation	Heat Matcher and PowerMatcher have provided several valuable lessons for the technical and organisational challenges that rise from the ambition to balance energy on a local level. These lessons will be taken into account in the RUGGEDISED project, in particular regarding WP 1, 4 and 5 of the project.
MAFMETIS	Climate – KIC 2015-2016	In the MAFMETIS project TNO developed a collaborative investment strategy for multi-actor investments in sustainable energy solutions. This kind of investments usually do not take place due to split-incentive and collective action problems, although the collective business case might be positive. The MAFMETIS method relies on transparent dialogue, mutual learning and collaborative calculation efforts to overcome the problems related to multi-actor investments.	The outcomes of the MAFMETIS highlight the necessity to involve stakeholders at the very beginning of collaborative investment processes. The method that was developed will be used in the development of the WP 1 framework for implementations of smart energy solutions in the city.
Mapping smart cities in the EU.	EU Parliament, DG for Internal Policies Policy Department Economic and Scientific policy.	The 'Mapping smart cities in the EU' study looked at 200 Smart City initiatives.	This study provided deep insight into the success factors of specific Smart City projects. It covered all the key measures also employed in the RUGGEDISED.
OPUS	European Commission 2013	Study on the Impact of 'Open platforms for web- based applications and services in Europe'.	The understanding and approach developed in this study will underpin the valorisation of project outcomes through the engagement of Startups and SMEs
ΡΙϹΟ	Dutch Ministry of Economic Affairs 2013-2015	Facilitates energy transition in the Netherlands in the built environment by designing, coupling and building tools that will take away obstacles for sustainable development in a process for multi- criteria, multi-stakeholder decision making that is based on the geodesign framework. The tools do this by using a geo-information environment to identify as many aspects as possible of a	RUGGEDISED will apply this approach and the tools developed for integrated planning and further preparation of lighthouse projects and replication plans. For instance in the City of Rotterdam or in the

		sustainable project beforehand and showing stakeholders what the best investment options are, considering e.g. economics, CO2-emissions, energy potential.	transition framework and follower cities.
PMC2	National funding	Smart Grids. This project analyses the opportunities for consumer involvement and multi goal smart grid optimization. See http://www.powermatchingcity.nl/site/pagina.php	The outcomes of this project relate to RUGGEDISED in the sense that they show the challenges to socially embed technical innovations. This specific knowledge will be used in the implementation framework WP 1 and the actual implementation of smart solutions in WP2, 3 and 4
Zero Energy Districts (GEN)	Mixed funding, partly Ministry of Interior Affairs 2011-2014	the feasibility of development, refurbishment and restructuring leading to energy neutral districts with a consortium including energy suppliers and network operators, construction companies, real estate developers, banks, and juridical specialists.	Main outcomes as route map towards low energy districts, building and district models for different options for energy efficiency, financial – economic model at district level can contribute to replication

Description of significant infrastructure and major items of technical equipment relevant to the project Not applicable

Large Infra structure Not applicable

Partner 8: ICLEI European Secretariat GmbH

(ICL)

www.iclei-europe.org



The European Secretariat of ICLEI – Local Governments for Sustainability (ICLEI Europe) addresses local sustainability in Europe, working closely with local governments and their partners to achieve this. Linked to the international association founded in 1990 (as the International Council for Local Environmental Initiatives) at the United Nations in New York, ICLEI has a growing global membership (+1200 cities, towns, counties and their associations worldwide). ICLEI works through performance-based, results-oriented campaigns and programmes to achieve tangible improvements in global environmental and sustainable urban development - <u>www.iclei.org</u>. Based in Freiburg, Germany, ICLEI Europe, has a staff of 50+ with a wide range of expertise and extensive experience in European project coordination and partnering. In the field of energy and climate change ICLEI Europe has a dedicated team working on local mitigation and adaptation actions, local energy action planning including solutions for the built environment, transport, energy and waste sectors.

ICLEI Europe has a strong multilingual information and communication team, experienced with developing communication strategies and tools. The team delivers strategy, design, communication materials and manages the dissemination requirements of a number of projects at European, regional and national levels in the field of energy and sustainable development. In addition to its membership network, ICLEI Europe has observer status with the United Nations Framework Convention on Climate Change (UNFCCC) and is a Covenant of Mayors (CoM) Supporter – in which capacity it shares information, mobilizes and facilitates the exchange of energy /climate relevant experiences between local governments. Relevant previous e.g. STRATEGO (www.stratego-project.eu/de) OPTIMUS (www.optimus-smartcity.eu) RESCUE (www.rescue-project.eu) and its connection to other Supporters and Coordinators and local governments across Europe will help to heighten any outreach impact of this project.

Main Role in Project: ICLEI will be co-ordinating the communication and dissemination activities within the project (WP9), and contributing to the work packages involving exploitation and replication.

Short CV of involved key researchers / staff members

Helen Franzen (f), Project Co-ordinator, Strategic Services Expert. Helen Franzen is Project Co-ordinator in the Communications and Member Relations team. She works on various communication and outreach activities for ICLEI and EU-funded projects such as OPTIMUS and PASTA. Her tasks include developing communication strategies, developing promotional materials, publications and online content; editorial oversight and quality control of project websites and newsletters; copywriting, copyediting and moderating social media accounts. Before joining ICLEI in 2013, she gained professional experience in the field of communication with a number of companies and charities including the United Nations Association (UNA) of the UK.

Simon Clement (m), Project Co-ordinator Expert. Over 10 years experience working within ICLEI's Sustainable Procurement team, co-ordinating numerous European projects, developing practical implementation guidance for public authorities in all European countries and sustainability purchasing criteria. Project management experience includes also 5 years experience working on public sector purchasing practices of buildings and construction, energy efficiency, construction materials and energy/electricity.

Holger Robrecht (m) is a renowned expert for sustainability management, resource efficiency, climate adaptation and ecosystem services and has been member of several international and EU Expert Groups, incl. ISO TC 268 'Sustainable Development of Communities' (since 2012), EU Expert Group for the Soil Thematic Strategy (2003) and the EU Work Group on Urban Environmental Management Plans and Systems (2004) and the EU Adaptation Steering Group (2010-2013). He is author and editor of various books and other publications. Before joining ICLEI, Mr. Robrecht led the Research department Soil Contamination, Soil Protection and Land-use management at the University of Dortmund, Institute for Environmental Research (1990-97).

Ruud Schuthof (m), Deputy Regional Director for Europe (Senior Expert), Ruud has been working with ICLEI since 2008. He is at the head of ICLEI's Communications and Member Relations team dealing with ICLEI's information and communication services, events and membership relations. He is involved in awareness raising, communication and dissemination coordination for transport projects, like the EC13 funded CIVITAS programme and European Mobility Week Campaign. Ruud is part of the coordination secretariat of the Eltis and SUMP portals. He is also involved in strategic programme development for major events, like the European Conference on Sustainable Cities and Towns in Geneva in 2013. Ruud has obtained 13 years of work experience in the area of public governance and has been involved in projects with funding from the European Commission, GTZ, national ministries and UNEP. Furthermore, he is an expert in organisational environment and change.

Relevant publications

- Procuring Innovative and Sustainable Construction A Guide for European Public Authorities (2012)
- Guidance for Public Authorities on Public Procurement and Innovation (2014)
- Clean Fleets Guide Procuring clean and efficient road vehicles (2014)
- Convenant capacity capacity SEAP Training Booklet (2014)

List of relevant previous projects or activities

Project acronym	Funding source / period	Topic of the project / activities
Grow Smarter	EC-Horizon 2020 (SCC01) 2015-2019	GrowSmarter aims to stimulate city uptake of 'smart solutions' by using the three Lighthouse cities (Stockholm, Cologne and Barcelona) as a way to showcase 12 Smart City solutions: from advanced information and communication technology and better connected urban mobility, to incorporating renewable energy sources directly into the city's supply network. <u>www.grow-smarter.eu</u>
ELTIS	IEE, EACI, EC 2013-2015	Eltis facilitates the exchange of information, knowledge and experiences in the field of sustainable urban mobility in Europe. It is aimed at individuals working in transport as well as in related disciplines, including urban and regional development, health, energy and environmental sciences. <u>www.eltis.org</u>
OPTIMUS	FP7 – 2013-2016	OPTIMUS – OPTIMising the energy USe in cities with smart decision support system The vision of OPTIMUS is to provide an integrated web-platform that will collect and structure real- time open data sets from five domains, namely: weather conditions, social mining, buildings' energy profiles, energy prices, energy production. At the same time, the system will take into account de-centralised renewable energy production, connection with the smart electricity grid and integration with smart district heating and cooling grids and other renewable energy sources. www.optimus-smartcity.eu

green.eu	EC – DG Research 2015-2019	green.eu European Global Transition Network on Eco-Innovation, Green Economy and Sustainable Development The inter- and transdisciplinary green.eu network (including knowledge brokers, programme owners and global industry networks) is research based and aims to accelerate the transition towards a green economy significantly, with a European focus on co-development of knowledge. It aims to exploit win-win- opportunities, improve the uptake of R&D results and the competitiveness of European enterprises. Green.eu is designed to address the challenges of the green economy process, ranging from the conceptualisation of the green economy, to the harmonisation of the approaches needed to coherently assess performance, and to identify gaps (successes and failures) for the effective adoption of technologies that can create win-win results.
RFSC	EC- DG Regional & Urban Policy 2012- 2014	Reference Framework for Sustainable European Cities (RFSC) A consortium of Platform31, ICLEI and CEMR was contracted by the European Commission to support the dissemination of the Reference Framework of European Sustainable Cities. The RFSC is an on-line toolkit to assist actors of urban management and development to improve dialogue and action on sustainability. It offers a multi-purpose decision-making and communication tool for promoting sustainable urban development. The main objective of the dissemination phase was to make cities aware of the availability of the RFSC and opportunities it offers to them.

Description of significant infrastructure and major items of technical equipment relevant to the project

No relevant significant infrastructure

Large Research Infra structure

	Cost (€)	Justification
Large research infrastructure	not applicable	not applicable

Partner 09: Erasmus University

(EUR)

lwww.eur.nl



Erasmus University Rotterdam (EUR) is a research university, driven by a strong focus on current social issues. The university concentrates its expertise on issues of management, organisation and policy in the public and private sectors on the one hand, as well as on the field of sickness and health care. Erasmus University Rotterdam has bundled its education and research in four areas of expertise in which the university has a national and international reputation to maintain:

- Health
- Wealth
- Governance
- Culture

The university counts as its core tasks: to generate knowledge from research, to share knowledge in education and to transfer knowledge to the community. Its driving forces are academic curiosity, critical reflection and social engagement.

Rotterdam School of Management (RSM), part of the Erasmus University Rotterdam (EUR), is a research-driven business school located in the Netherlands. The overall mission is to be a leading international business school, acquiring, disseminating, transferring and applying knowledge, guided by the future needs of international business. In 1999 the school was awarded the EQUIS accreditation, the quality label of the European Foundation of Management Development (EFMD). Today, the EUR offers a diversified portfolio of accredited teaching and research programs, ranging from pre-experience MSc to postgraduate Master and executive development and from fundamental research to applied research and business support, which are renowned throughout the world.

RSM is rated as one of Europe's leading business schools and is up fronting the application of Information Technology to business and modern management techniques. The research program of the Department of Technology & Operations Management (TOM) is focused on Supply Chain Excellence. Over the last decades new, disruptive technologies have emerged, while customers have become more and more demanding. Companies are facing challenges to deliver products and services to end-customers in time and according to requirements, while applying new business models. Supply chain excellence will be a key strategic factor for companies to create competitive advantage. Supply chain excellence is the ability of companies to excel in developing products and services, in executing operations, in distribution and logistics activities and in renewing their supply chains. Supply chain excellence can be achieved by combining capabilities from operational management, business information management, and innovation management to create sustainable value. The department TOM focuses on three research themes:

- 1. Logistics and transportation including storage, transshipment, mobility, synchromodality, city distribution and service logistics.
- 2. Operations and innovation management including behavorial operations, idea generation, process innovations, cradle 2 cradle and business model innovation.
- 3. Next generation information systems including energy informatics and smart energy grids, data science and business analytics, business social media, crowdsourcing, intelligent agents.

Many of the fundamental theoretical results that were achieved have their roots in practical projects that were done in cooperation with companies like KLM, Dutch Railways, Dutch Flower Auctions, The Port of Rotterdam, Heineken, ABN AMRO Bank, Microsoft, and many governmental agencies (like Customs, Central Bureau of Statistics) etc. The research projects in these(inter)national programs require cooperation between companies, research institutes, governmental organizations and Universities and have a multidisciplinary approach to problems in which information and communication technologies aspects are combined with logistic and related business process design questions. More information on RSM and the research activities of the Department of Technology & Operations Management can be found on the following <u>webpage</u>.

The following EUR research centres will participate and bring in expertise:

SCC-1-2016

The Erasmus Centre for Future Energy Business (<u>http://www.rsm.nl/energy</u>) (in short ECFEB) is an interdisciplinary energy market research centre located at the Rotterdam School of Management, Erasmus University. We bring together energy practitioners, policy makers, and researchers from Economics, Computer Science, Behavioural Sciences, and Management Sciences to guide and to shape the transformation of the energy sector. Our research covers the areas Future Energy Markets, Competitive Performance, and Policy Guidance, with energy informatics as core area of expertise. The Erasmus Centre for Future Energy Business has successfully participated in EU project CASSANDRA (FP7-ICT-2011-288429) and manages the PowerTAC simulation platform (<u>www.powertac.org</u>), the world's largest open source smart energy grid simulation platform. Furthermore, The Erasmus Centre for Future Energy Business organized the yearly Erasmus Energy Forum event for knowledge sharing and networking among politicians, business executives and academia, see <u>www.erasmusenergyforum.com</u>. The centre's methodological expertise is focused on (1) Data analytics and (development of) software agents, (2) simulations - specifically using the PowerTAC simulation platform, (3) behavioural research, including lab experiments, prototyping experiments and real life field experiments.

The **Erasmus Center for Data Science and Business Analytics** supports organizations in turning data into business solutions (see https://www.erim.eur.nl/erim-centres/data-science-business-analytics/). The center offers knowledge and analytical skills to identify business *opportunities* in public and private data, develops *methodologies* to analyze and visualize data and helps organizations to *exploit* data-based insights and to develop and optimize business propositions based on data analytics. Long term collaborations include collaborations with Floraholland and Dutch railways NS. The centre also participates in the knowledge lab 'Urban Big Data' (http://www.kenniswerkplaats-urbanbigdata.nl/), a collaborative effort between the City of Rotterdam and the Erasmus University Rotterdam aimed at the development of knowledge about the use and impact of big data on urban processes and governance, and to apply this knowledge in services and products for practical use. Specifically, it promotes big data research on urban mobility and logistics, sustainable transport, quality of life, tourism and culture, safety and security, transitions in the work place, themes that are relevant for urban governance and science.

The **Erasmus Center for Innovation Management (ECIM)** is a dedicated group of leading academic researchers performing theoretical and applied research in the field of innovation management, including the front end of innovation (idea management), innovation project control, innovation leadership, design-driven innovation, system innovation, sustainable innovation and open innovation and business models. Enhancing innovation in business firms and public organizations is a central issue in economic and social policies of European and national governments. Innovation management contributes to the implementation of such policies by improving the effectiveness and efficiency of innovation activities. Innovation management concerns the management and organization of the generation, development and commercialization of new products, new services, new business models, and/or new knowledge by the firm.

RHV | Urban, Port and Transport Economics is a research and education institute based at Erasmus University Rotterdam. At the core of our business are three themes: <u>Urban and Regional Economics</u>, Port Economics and Transport Economics. RHV's mission is to deliver practical research solutions grounded in science. More specifically, its goal is to provide government and industry with cutting-edge knowledge, international best practice advice and workable policy recommendations. Relevant expertise that will be brought into the project includes smart parking, mobility management, Real Estate Economics and urban area development.

CVs of involved key researchers / staff members

Professor Wolfgang Ketter (m) is a Professor of Next Generation Information Systems at the Department of Technology and Operations Management at Rotterdam School of Management, Erasmus University. Professor Ketter is the founder and director of the Learning Agents Research Group at Erasmus. The goal of this group is to research, develop and apply autonomous and mixed initiative intelligent agent systems to support human decision making in the area of business networks, electronic markets, energy grids and supply chain management. His is also the founder and director of the Erasmus Center for Future Energy Business which enables robust, intelligent, efficient and sustainable energy networks of the future. Professor Ketter leads Power TAC, a new TAC competition on energy retail markets. Since 2011 he has served as the chair of the IEEE Task Force on Energy Markets. His research has been published in information systems- and computer science

journals such as AI Magazine, Decision Support Systems, Electronic Commerce Research and Applications, Energy Economics, Energy Policy, the European Journal of Information Systems, INFORMS-OR/MS Today, INFORMS, Information Systems Research and the International Journal of Electronic Commerce. He serves on the editorial board of MISQ and BISE. He has given numerous distinguished lectures at international conferences, and renowned universities including Harvard University, the University of Minnesota, the University of Liverpool, RWTH Aachen, the University of Connecticut, TU Delft, KIT, the University of Mannheim and University of St. Thomas. He received his PhD in Computer Science from the University of Minnesota in 2007. <u>Publications Wolf Ketter</u>

- 1. Ketter, W., Peters, M., Collins, John & Gupta, A. (2016). A Multi-agent Competitive Gaming Platform to address Societal Challenges. MIS Quarterly.
- 2. Lu, Y., Gupta, A., Ketter, W. & Heck, E. van (2016). Exploring Bidder Heterogeneity in Multi-channel Sequential B2B Auctions: Evidence from the Dutch Flower Auctions. MIS Quarterly, 40 (3).
- 3. Ketter, W., Peters, M., Collins, J. & Gupta, A. (2016). Competitive Benchmarking: An IS Research Approach to Address Wicked Problems with Big Data and Analytics. MIS Quarterly.
- 4. Hogenboom, A.C., Ketter, W., Van Dalen, J., Kaymak, U., Collins, J. & Gupta, A. (2015). Dynamic Pricing in Multi-Agent Supply Chain Markets using Economic Regimes. Decision Sciences, 46 (4), 791-818

5.

Dr. Yashar Ghiassi-Farrokhfal (m) is an Assistant Professor at the Department of Technology and Operations Management at Rotterdam School of Management, Erasmus University. The main focus of his research is on electricity markets, atochastic modelling of renewables (solar and wind) and storage, optimal design of solar PV farms and hybrid storage systems and matching of supply and demand. Dr. Ghiassi-Farrokhfal received his PhD in Electrical and Computer Engineering in 2011 from the University of Toronto.

Publications Yashar Ghiassi-Farrokhfal

- 1. Ghiassi-Farrokhfal, Y., Rosenberg, C., Keshav, S. & Adjaho, M-B (2016). Joint Optimal Design and Operation of Hybrid Energy Storage Systems. IEEE Journal on Selected Areas in Communications.
- 2. Ghiassi-Farrokhfal, Y., Keshav, S., Rosenberg, C. & Ciucu, F. (2015). Solar Power Modelling: An Analytical Approach. In Vol. 6. IEEE Transactions on Sustainable Energy (pp. 162-170).
- 3. Ghiassi-Farrokhfal, Y., Keshav, S. & Rosenberg, C. (2015). Towards a Realistic Storage Modelling and Performance Analysis in Smart Grids. In IEEE Transactions on Smart Grid.
- 4. Ghiassi-Farrokhfal, Y., Kazhamiaka, F., Rosenberg, C. & Keshav, S. (2015). Optimal Design of Solar PV Farms With Storage. In Vol. 6. IEEE Transactions on Sustainable Energy (pp. 1586-1593).

5.

Dr. Marcel van Oosterhout (m) is senior project manager at the department of Technology and Operations Management at Rotterdam School of Management, Erasmus University. He is responsible for business development and project management and a member of the daily board. Furthermore, Marcel is business director for the Erasmus Centre for Future Energy Business and Programme manager Erasmus Centre for Data Science and Business Analytics. Marcel likes to initiate and develop innovative ideas and projects on the edge of science and practice, which combine people, technology, knowledge and innovation. Marcel received his PhD from the Rotterdam School of Management in 2010 on the topic "Business Agility and Information Technology in Service Organizations". Marcel has participated in over 50 (inter)national contract research and government funded projects within different industries. Marcel also has been involved as a project manager and senior researcher in various nationally and EU-funded research projects such as INTEGRITY and CASSANDRA. <u>Publications Marcel van Oosterhout</u>

- 1. Liu, L., Daniels, H.A.M., Oosterhout, M.P.A. van & Dalen, J. van (2013). Business Intelligence for Improving Supply Chain Risk Management. International Journal in Advanced Logistics, 2 (2), 18-29.
- 2. Heck, E. van, Baalen, P.J. van, Meulen, D. van der & Oosterhout, M.P.A. van (2012). Achieving High Performance in a Mobile and Green Workplace: Lessons from Microsoft Netherlands. MIS Quarterly Executive, 11 (4), 175-188.
- 3. Veenstra, A.W., Zuidwijk, R.A. & Oosterhout, M.P.A. van (2010). Benefit analysis of visibility in global logistics chains. In Conference Proceedings of 2010 Annual Conference of the International Association of Maritime Economics. Lisbon: International Association of Maritime Economists.

SCC-1-2016

Dr Jan van Dalen (m) is an Associate Professor of Statistics at the department of Technology and Operations Management at Rotterdam School of Management, Erasmus University. He holds PhD in Econometrics obtained from the School of Economics of the Erasmus University. He is the co-founder of the recently established Erasmus Centre for Data Science and Business Analytics, and co-director of E-Urban, and leads the Urban Big Data knowledge lab in collaboration with the City of Rotterdam. Jan's main research interests are in quantitative analysis of information, logistics, trade and organizational processes, and he has been involved in research programmes that include monitoring trade and traffic flows with CBS, trade lane risk assessment in Cassandra, and cross-chain collaboration in 4C4More/Dinalog. He has extensive teaching experience in applied statistics, forecasting and big data.

Publications Jan van Dalen

- 1. Hogenboom, A.C., Ketter, W., Van Dalen, J., Kaymak, U., Collins, J. & Gupta, A. (2015). Dynamic Pricing in Multi-Agent Supply Chain Markets using Economic Regimes. Decision Sciences, 46 (4), 791-818.
- Kahlen, M.T., Ketter, W. & Dalen, J. van (2014). Agent-coordinated Virtual Power Plants of Electric Vehicles (Extended Abstract). In Proceedings of the 13th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2014) (pp. 1547-1548). Paris, France: International Foundation for Autonomous Agents and Multiagent Systems.
- 3. Kahlen, M.T., Ketter, W. & Dalen, J. van (2014). Balancing with Electric Vehicles: A Profitable Business Model. In Proceedings of the 22nd European Conference on Information Systems (pp. 1-15). Tel Aviv, Israel.[go to publisher's site]
- 4. Liu, L., Daniels, H.A.M., Oosterhout, M.P.A. van & Dalen, J. van (2013). Business Intelligence for Improving Supply Chain Risk Management. International Journal in Advanced Logistics, 2 (2), 18-29.

Prof. Jan van den Ende (m) is a professor of management of technology and innovation at RSM and holds the International Chair of Management, LUISS Universita Guido Carli, Rome, Italy. His field of expertise is the development process of new products, services and business models in firms. His current research interests include firm-internal and -external idea management, control of NPD projects, design management and sustainable innovation. Jan van den Ende has published in numerous academic journals and teaches in MBA and Executive Education for firms such as ASML, FrieslandCampina, IFF and MAN, but also many smaller companies. Publications Jan van den Ende

- 1. Deichmann, D. & Ende, J. van den (2014). Rising from Failure and Learning from Success. The Role of Past Experience in Radical Initiative Taking. Organization Science, 25 (3), 670-690.
- 2. Ende, J. van den, Jaspers, F.P.H. & Rijsdijk, S.A. (2013). Should System Firms Develop Complementary Products? A Dynamic Model and an Empirical Test. Journal of Product Innovation Management, 30 (6), 1178-1198. doi: http://dx.doi.org/10.1111/jpim.12053
- 3. Ende, J. van den, Kaa, G. van de, Uijl, S. den & Vries, H.J. de (2012). The Paradox of Standard Flexibility: The Effects of Co-evolution between Standard and Interorganizational Network. Organization Studies, 33 (5-6), 705-736.
- 4. Rijsdijk, S.A. & Ende, J. van den (2011). Control combinations in new product development projects. Journal of Product Innovation Management, 28 (6), 868-880.

Prof. Leo Kroon (m) is a professor of quantitative logistics at the Department of Technology and Operations Management, Rotterdam School of Management, Erasmus University (RSM). Leo Kroon is a professor at RSM as well as a logistics consultant in the department of Process quality and Innovation Netherlands Railways (NS), the main operator of passenger trains in the Netherlands. His main research interest is the development of decision support tools for the planning and real-time operations control of logistic systems, in particular public transport systems. His research involves close cooperation with practice and has resulted in numerous published articles in journals including Transportation Science, Transportation Research B, and Interfaces. Professor Kroon was a member of the NS team that won the prestigious INFORMS Edelman Award 2008 for its model-based contributions to the development of the 2007 NS timetable. He was a coordinator of a Dutch team in the EU funded research project ON TIME. This project focuses on robust planning and effective recovery of railway systems. Currently he is also the project leader of the NWO funded Complexity in Public Transport project. He is an Associate Editor of the journal Transportation Science. Publications Leo Kroon

- 1. Veelenturf, L.P., Potthoff, D., Huisman, D., Kroon, L.G., Maroti, G. & Wagelmans, A.P.M. (2016). A Quasi-Robust Optimization Approach for Crew Rescheduling. Transportation Science, 50 (1), 204-215.
- 2. Veelenturf, L.P., Cacchiani, V., Kidd, M, Kroon, L.G. & Toth, P. (2016). A railway timetable rescheduling approach for handling large scale disruptions. Transportation Science, Accepted.
- 3. Zhan, S., Kroon, L.G., Veelenturf, L.P. & Wagenaar, J.C. (2015). Real-Time High-Speed Train Rescheduling in Case of A Complete Blockage. Transportation Research. Part B, Methodological, 78, 182-201.
- 4. Dollevoet, T.A.B., Huisman, D., Kroon, L.G., Schmidt, M.E. & Schöbel, A. (2015). Delay Management including Capacities of Stations. Transportation Science, 49 (2), 185-203.

Dr. Marie Schmidt (f) is an assistant professor of Operations Management at Rotterdam School of Management, Erasmus University Rotterdam. Marie"s research interests cover optimization in transportation planning, decision-making under uncertainty (in particular robust optimization), multi-criteria optimization and game theory. Marie obtained her PhD in Mathematics from University of Goettingen. Her PhD thesis titled "Integrating Routing Decisions in Network Problems" received the dissertation award of the German Operations Research Society in 2012.

Publications Marie Schmidt

- 1. Kuhn, K., Raith, A., Schmidt, M.E. & Schöbel, A. (2016). Bicriteria robust optimization. European Journal of Operational Research, 252, 418-431
- 2. Schmidt, M.E. & Schöbel, A. (2015). Timetabling with Passenger Routing. OR Spectrum, 37 (1), 75-97.
- 3. Dollevoet, T.A.B., Huisman, D., Kroon, L.G., Schmidt, M.E. & Schöbel, A. (2015). Delay Management including Capacities of Stations. Transportation Science, 49 (2), 185-203.
- 4. Schmidt, M.E. & Schöbel, A. (2015). The Complexity of integrating passenger routing decisions in public transportation models. Networks, 65 (3), 228-243.

Giuliano Mingardo (m) is senior researcher and lecturer at the Department of Urban, Port and Transport Economics (RHV) at Erasmus University Rotterdam and founder of the Mobility Management Academy (<u>www.eur.nl/mma</u>). He has worked in academia since 2000 on several research projects both at national and European level mainly in the fields of urban transport. Giuliano is specialized in parking policy and mobility management and regularly advises local governments and large companies on these issues. <u>Publications Giuliano Mingardo</u>

- 1. Mingardo G, van Wee B and Rye T (2015) Urban parking policy in Europe: a conceptualization of past and possible future trends, Transportation Research Part A: Policy and Practice, Vol. 74, pp. 268-281.
- 2. Van Ommeren J, de Groote J and Mingardo G (2014) Residential parking permits and parking supply, Regional Science and Urban Economics, Vol 45, pp 33-44
- 3. Mingardo G (2013) Transport and environmental effects of rail-based Park and Ride: evidence from the Netherlands, Journal of Transport Geography, Vol. 30, pp 7-16.
- 4. Mingardo G and Meerkerk J (2012) Is parking supply related to turnover of shopping areas? The case of the Netherlands, Journal of Retailing and Consumer Services, Vol. 19, pp 195-201.

Professor Erik-Hans Klijn (m) is professor at the Department of Public Administration of Erasmus University Rotterdam and visiting professor at the University of Birmingham (School of Government and Society). His research and teaching activities focus on complex decision-making and management in networks, institutional design and Public Private Partnerships mainly in the area of environmental and housing policy. Recently his research extended to branding and the impact of media on complex decision-making. He has published extensively in international journals and is author together with Professor Joop Koppenjan of the book *Managing Uncertainties in networks* (2004, Routledge) and of *Branding in governance and Public Management* (Routledge, 2012) together with dr.ir. Jasper Eshuis.

Publications Klijn

- 1. Klijn, E.H. (2016). Managing commercialised media attention in complex governance networks: Positive and negative effects on network performance. Policy & Politics, 44 (1), 115-133.
- 2. Klijn, E.H., Sierra, V, Ysa, T, Berman, E, Edelenbos, J. & Chen, D (2016). The influence of trust on network performance in Taiwan, Spain and The Netherlands: a cross country comparison. International Public Management Journal, 19 (1), 111-139

- 3. Klijn, E.H., Twist, M.J.W. van, Steen, M. van der & Jeffares, S.R. (2016). PUBLIC MANAGERS, MEDIA INFLUENCE AND GOVERNANCE: THREE RESEARCH TRADITIONS EMPIRICALLY EXPLORED. Administration and Society.
- 4. Nederhand, M.J. & Klijn, E.H. (2015). Public private partnerships and the involvement of the civil society. An inquiry into the relation between stakeholder involvement and performance in Dutch PPP projects. In EGPA Conference. Toulouse.

List of relevant previous projects or activities, connected to the subject of this proposal

Among the projects EUR has participated in the past the following 5 are the ones most relevant to the current proposal:

- 1) CASSANDRA (FP7-288429) (<u>http://www.cassandra-fp7.eu</u>)- A multivariate platform for assessing the impact of strategic decisions in electrical power systems, 2011-2014. Tasks undertaken: Cassandra theoretical model, Cassandra software development, Dissemination activities.
- 2) PowerTAC (<u>www.powertac.org</u>). Initiated and manager of the Power Trading Agent Competition, an open competition platform that tests models of agent behaviour. Inviting participation from research teams worldwide, the platform simulates the behaviour of brokers of energy within the market. It creates an environment where the potential impact of policy decisions, technological changes and consumption behaviour can be observed with respect to the changing decisions of energy traders. In this way the vital nexus of the energy market can be simulated and possible effects of decisions more clearly discerned. Also in conjunction with Power TAC, other trading competitions simulate models of other behaviour such as producers and consumers. The PowerTAC environment also serves conducting *what...if* analysis on future scenarios.
- 3) Erasmus Energy Forum (<u>www.erasmusenergyforum.com</u>). Our annual international Erasmus Energy Forum event organized for the fourth time in 2015 is unique in that it brings together many stakeholders to discuss the future of energy, and energy of the future. We aim to establish a pan-European community of the future energy landscape, which can also serve EU projects to disseminate and share knowledge and insights. As such, the Erasmus Energy Forum has the following goals:
 - a. develop relationships between the participants of the future energy landscape
 - b. set up a platform for exchange of expert information and best practices
 - c. explore models of alternative resource sharing and storing
 - d. define ways to increase energy efficiency and efficient allocation of resources

The Energy Forum is targeted at policy makers, business and academia and comprises of a business day and a science day. It is relevant for managers working in the energy industry or responsible for procurement of energy for large end users. This includes industries such as port industry, all kinds of manufacturing, high-tech and ICT, steel, chemicals and agriculture.

- 4) Mining Electric Vehicle Charging Patterns for Competitive Benchmarking Simulations. The goal of this project is to understand the impact that widespread, consumer adoption of electric vehicles (EVs) will have on the residential energy grid. The project includes an analysis of actual consumer data, from the Netherlands and the United States, for behavioral patterns in the location, frequency, and volume with which consumers charge their EVs. Actual consumer data will be used to drive computer simulations that will allow to test the impact of different grid infrastructure upgrades and pricing policies on EV charging behavior. The project is executed in collaboratrion with University of Berkeley and co-funded by a research grant from the Siebel Energy Institute <u>http://www.siebelenergyinstitute.org/</u>
- 5) ON-TIME: FP7 Transport project. The ON-TIME project with the tittle "Optimal Networks for Train Integration Management across Europe" has been completed in October 2014 and the main objective was to implement a step-change in railway capacity by reducing delays and improving traffic fluidity. With EU funding of EUR 5.4 million, the 19-member consortium aimed to improve railway planning and operations management. ON-TIME targeted management of both passenger and freight services. <u>http://cordis.europa.eu/project/rcn/99958_en.html</u>

Description of significant infrastructure and major items of technical equipment relevant to the project

For the use of big data and in order to run the Power TAC simulation, we will need to make use of the EUR server and its capacity may need to be extended

Large Infra structure

	Cost (€)	Justification
Large research infrastructure		Not applicable

SCC-1-2016

Partner 10: Umeå University



(UU)

www.umu.se

Umeå University was founded in 1965 and is Sweden's fifth oldest university. Today, it has a strong international and multicultural presence with students, teachers and researchers from all over the world. As one of the leading comprehensive universities in Sweden, it is alive with enthusiasm, creativity and fresh ideas, involving over 31,000 full-time, part-time and distance students, 8 Schools and Institutes, 31 degree programmes taught entirely in English, 242,324 m² (Campus Umeå), and 900 international exchange agreements.

Umeå University has several roles in the project, both as a tenant in the University City innovation area, and as a research organisation, primarily involving two research units, TFE and TRUM.

The Department of Applied Physics and Electronics (TFE) conducts undergraduate, postgraduate education and research within the areas of: Energy efficiency with emphasis on Buildings, Energy Technology and Thermal Process Chemistry, Applied Electronics with specialization in Biomedical Engineering, Automatic Control and Robotics, Applied Electronics with specialization in embedded systems, Signal processing with emphasis on interface and Media Technology. The energy efficiency (EE) group is one of the flag-ship research group within the TFE. The research focus of the EE group is energy efficiency in the building sector. The group is multi-disciplinary and comprises of 12 researchers who have expertise in diverse energy field. The expertise in the group includes energy efficiency validations based on measurements and advanced analysis, energy efficient retrofitting of buildings, building energy performance analysis and conducting surveys to understand homeowners' energy efficiency behaviour. TFE has close cooperation with building industry in the region and has a strong network of energy and building professionals in the region as for the past several years we are successfully running programs on Master of Science (300 credits) in Energy Engineering and Bachelor's of Science (180 credits) in Energy Engineering.

The research group at TFE has experience in several national and international collaborative research projects. For example, currently the group is involved in a project with Norwegian, Finnish and Russian partners on a project on sustainable building in high North. Also, our group in the past had successful cooperation with Universities in the Botnia Atlantica region. Such projects has shown that the groups' expertise could be highly useful in facilitating energy efficiency improvements in the building sector in different European regions. The multidisciplinary expertise of the group would be useful in several objectives under "low-energy district" theme in this EU proposal.

The Transportation Research Unit (TRUM) was formed in 1981 with the aim to promote interdisciplinary research in the field of transportation. TRUM is an entirely externally funded research-unit organizationally located at the Department of Geography and Economic History at Umeå University. Research at TRUM is has a social science research focus and emphasis passenger transports. The focus is on the individual perspective and the individual is seen as both a creator of the demand for passenger transports and a user of the available transportation system.

Research carried out at TRUM has its base in society, business, transport market and citizens' increasing demands for sustainable urban and rural areas. Overall the research focuses on the requirements for good mobility and high degree of availability in relation to the damnds for change in relation to climate change. Research at TRUM focuses primarily on the individual, which means that we intend to identify, understand and analyze how individual-specific risk and spatial perceptions, attitudes and habits, personal resources (e.g., personal finance and knowledge), and the social, geographical, economic and transportation market-related context we live in influences transport-related experiences of availability, expressed intentions and actual behavior.

Staff profile

Thomas Olofsson (Male)

Role in the project: Research coordinator and researcher: Department of Applied Physics and Electronics, Umeå University.

Qualification PhD in Applied Physics, Umeå University

MSc in Civil Engineering

Staff category: Professor - Applied Physics and Electronics, Umeå University and visiting Professor in Building Technology at Dalarna University, Sweden

Short description of work experience, <u>relevant to the proposal</u>: Has coordinated several national and international projects. Those which are relevant to the projects wherein he is/was Umeå University's research coordinator are provided below:

- Energy efficiency in Buildings (IEEB): Interreg IVA Nord Program (2010-2014)
- New method for measurement of heat loss from buildings: Swedish Energy Agency (2015-2017)
- Sustainable Buildings in The high North: Kolartic ENPI CBC program (2012-2015)

Sustainable Ålidhem: The Swedish Delegation for Sustainable Cities (2010-2015) Relevant publications*:

- 1. Olofsson T. and Mahlia T.M.I., 2012. Modeling and simulation of the energy use in an occupied residential building in cold climate, Applied Energy, Vol. 91, 432-438.
- 2. Ohlsson, K. E. A. and Olofsson T, 2014, Quantitative infrared thermography imaging of the density of heat flow rate through a building element surface, Applied Energy, 134: 499-505
 - 3. Ingrid, A., Olofsson, T., Osama, H., 2013. Methods for energy analysis of residential buildings in Nordic countries. Renewable & sustainable energy reviews 22, 306-318

*Thomas has authored/co-authored about 75 publications and is currently supervising 5 PhD students.

Gireesh Nair (Male)

Role in the project: Researcher: Department of Applied Physics and Electronics, Umeå University

Qualification: PhD in Ecotechnology and Environmental Science, Mid Sweden University, Sweden MSc in Environmental Science Policy and Management: Lund University, Sweden and Central European University, Budapest, Bachelor of Technology – Mechanical Engineering.

Staff category: Senior Lecturer - Applied Physics and Electronics, Umeå University

Short description of work experience, <u>relevant to the proposal*</u>:

PhD Researcher on Implementation of Energy efficiency measures in in Swedish Buildings: Swedish Energy Agency (2007-2012)

Researcher - Sustainable Buildings in The high North: Kolartic ENPI CBC program (2014-2015)

Researcher - Sustainable Development in Umeå Municipality with a focus on energy efficiency in buildings and mobility: Swedish Energy Agency (2015-2017)

Relevant publications**:

Nair, G., Gustavsson, L., Mahapatra, K., 2010. Factors influencing energy efficiency investments in existing Swedish residential buildings. Energy Policy 38, 2956-2963.

Nair, G., Mahapatra, K., Gustavsson, L., 2012. Implementation of energy-efficient windows in Swedish single-family houses. Applied Energy 89, 329-338

* In addition to academic experience Gireesh has work experience of about 8 years as a consultant in energy efficiency improvements in different sectors. He is currently co-supervising one PhD student.

** He has authored/co-authored 28 publications

Mohsen Soleimani-Mohseni (Male)

Role in the project: Researcher: Department of Applied Physics and Electronics, Umeå University Qualification PhD Energy Engineering, Chalmers University of Technology

MSc Energy Engineering from Chalmers University of Technology, Sweden

Staff category: Senior Lecturer - Applied Physics and Electronics, Umeå University

Short description of work experience, relevant to the proposal:

Research coordinator and leader of one work package - EE-HIGHRISE: FP7-ENVIRONMENT Researcher: Concept for renovation and upgrading of residential building: Nordic Built (2014-2016)

Researcher: Million programme Areas: Formas (2009-2010)

Relevant publications:

Gustafsson, A., Östman, L., Andersson, A., Dahlbäck, Y., Borg, A., Soleimani-Mohseni, M., 2015 Wood for construction (trä på betong in Swedish). Bygg and Teknik (Mohsen is currently co-supervising one PhD student.)

Ronny Östin (Male)

Role in the project: Researcher: Department of Applied Physics and Electronics, Umeå University Qualification PhD Applied Physics, Umeå University, MSc Technical Physics, Umeå University Staff category: Senior Lecturer - Applied Physics and Electronics, Umeå University

Short description of work experience, relevant to the proposal:

Researcher: Energy performance of low energy buildings in cold climate: Swedish Energy Agency (2009-2013) Researcher: New method for measurement of heat loss from buildings: Swedish Energy Agency (2015-2017) Researcher: Sustainable Buildings in The high North: Kolartic ENPI CBC program (2012-2015)

Member of Swedish National Renovation Centre in Lund (2013-2015)

Relevant publications:

Östin, R., 2012. Energy Efficient buildings in cold climate, Bygg and Teknik 8; 39-42. (Energieffektivt byggande i kallt klimat: Swedish)

(Ronny is currently co-supervising one PhD student.)

Shafiq ur Rehman (Male)

Role in the project: Researcher

Qualification PhD. Signal Processing, Umeå University, Sweden, M.Sc. Computer Engineering, Umeå University, Sweden

Staff category: Assistant Professor and managing director i2lab

Short description of work experience, relevant to the proposal: Shafiq Ur Réhman is managing director of the immersive interaction lab (i2lab) at UmU. He works in applied interaction technology, signal processing, computer vision, and image processing. Before joining academia he has successfully completed several industrial projects for companies such as Sony Eriksson, Boliden, Tieto Enator, and Permobil AB. He is currently coordinating national projects related to computer vision and interaction technology with entities such as Process IT, SCA Skog. He also manages international projects with SAIT in China, AIST in Japan, and City University in Hong Kong. Shafiq will perform studies related to smart integrated infrastructure and Data management. He has been involved in following previous EU project:

INTRO-Interactive Robotics research network <u>http://introbotics.eu/</u>

FP5: MUCHI- Multi-modal human-computer interaction

Relevant publications:

M.S.L. Khan and Shafiq ur Réhman, 2014. "Distance Communication: Trends and Challenges and How to Resolve them," In Handbook: Strategies for a Creative Future with Computer Science, Quality Design and Communicability. Blue Herons (EDs). Ch. 9, ISBN: 978-88-96471-13-5.

Shafiq ur Réhman, Li Liu, 2010. iFeeling, Vibrotactile Rendering of Human Emotions on Mobile Phones, Mobile Multimedia Processing: Fundamentals, Methods, and Applications by Springer in the LNCS State-of-the-Art Surveys subseries, , Vol. 5960, p1-20.

Lv, Zhihan, Alaa Halawani, S. Feng, Haibo Li, and Shafiq Ur Réhman. 2014. "Multimodal Hand and Foot Gesture Interaction for Handheld Devices." ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM) 11, no. 1s: 10

Shafiq has authored/co-authored 53 publications.

Annika Nordlund (Female)

Role in the project: Researcher: Transportation Research Unit, Umeå University Qualification: PhD Psychology, Umeå University

Staff category: Associate Professor – Department of Psychology, Umeå University

Short description of work experience, relevant to the proposal:

- Researcher: Umeå as a test bed for smart sustainable city development: Swedish Energy Agency (2014-2016)
- Researcher: Perceived opportunities and barriers to the acceptance of different types of electric vehicles in Sweden: Swedish Energy Agency (2013-2016)
- Researcher: Bothnia Line: New tracks towards future personal traveling?: VINNOVA (2009-2013)
- Researcher: BEST Bioethanol for Sustainable Transport: EU (2006 2009)
- Researcher: Sustainable Transport in the Households: Effects of values, Attitudes, and Habits: Swedish Environmental Protection Agency (2003-2008)
- Director of Research at the Transportation Research Unit

Relevant publications

- Nordlund, A. Jansson, J., & Westin, K. (2016). New transportation technology: Norm activation process and the intention to switch to an electric/hybrid vehicle. Accepted for publication in Transportation Research Procedia.
- Nordlund, A. & Westin, K. (2013) Influence of values, beliefs, and age on intention to travel by a new railway line under construction in northern Sweden. *Transportation Research A, 48,* 86-95. Jansson, J., Marell, A., & Nordlund, A. (2011). Exploring consumer adoption of a high involvement eco-innovation using value-belief-norm theory. *Journal of Consumer Behaviour, 10,* 51-60.
- Nordlund, A., & Westin, K. (2011). Forest values and forest management attitudes among private forest owners in Sweden. *Forests*, 2(1), 30-50
- Jansson, J., Marell, A., & **Nordlund**, A. (2010). Green Consumer Behaviour: Determinants of Curtailment and Eco-Innovation Adoption. *Journal of Consumer Marketing*, *27*, 358-370.
- Eriksson, L., Nordlund, A., & Garvill, J. (2010). Expected car use reduction in response to structural travel demand management measures. *Transportation Research Part F: Traffic Psychology and Behaviour, 13*, 329-342.
- Jansson, J., Marell, A., & **Nordlund**, A. (2009). Elucidating green consumers: A cluster analytic approach on proenvironmental purchase and curtailment behaviors. *Journal of Euromarketing*, *18*, 245-267.
- Eriksson, L., Garvill, J., & **Nordlund**, A. (2008). Acceptability of single and combined transport policy measures: The importance of environmental and policy specific beliefs. *Transportation Research Part A: Policy and Practice, 42,* 1117-1128.
- Eriksson, L., Garvill, J., & **Nordlund**, A. (2008). Interrupting habitual car use: The importance of car habit strength and moral motivation for personal car use reduction. *Transportation Research Part F: Traffic Psychology and Behavior*, *11*, 10-23.
- Eriksson, L., Garvill, J., & **Nordlund**, A. (2006). Acceptability of travel demand management measures: The importance of problem awareness, personal norm, freedom, and fairness, *Journal of Environmental Psychology*, *26*, 15-26.
- Nordlund, A. M., & Garvill, J. (2003). Effect of Values, Beliefs and Personal Norms on Willingness to Reduce Car-use. *Journal of Environmental Psychology, 23,* 339-347.
- Garvill²¹, J., Marell, A., & **Nordlund**, A. M. (2003) Effects of increased awareness of choice of travel mode. *Transportation*, *30*, 63-79

Richard Olsson (Male) Head of property maintenance, UmU

List of relevant previous projects or activities, connected to the subject of this proposal

Project name	Funded by	Budget involved for your organisation	Dates (start/end)
EE-High-rise	EU	€0.6M	2013-2015

The overall objective of the project is to demonstrate and validate new technologies, concepts, and systems used in EE-HIGHRISE project, in order to test and assess the technological and economic feasibility of innovative energy solutions in high rise demo building Eco Silver House. Demo high rise building Eco Silver House is located in the city centre of Ljubljana, Slovenia. The building will have 17 floors, with 4 basement floors. The residential area includes 128 passive flats and solely the residential area is the proposed demonstration area.

The project involve several partners which include Akropola Druzba Za Inzeniring, Slovenia, Cybrotech Limited, United Kingdom, Elektron Drustvo SA Og., Croatia, R.e.d. Srl, Italy, Umeå University, Sweden Umeå University is the leader of work package wherein the objective is to develop cost effective building models of energy efficient high rise buildings in EU which has high market delployment possibilities. The models will be developed for architectural EE and RES design, HVAC system and control system. Regional specific models will be adapted to different scenarios - for Mediterranean and Central Europe.

Project name	Funded by	Budget involved for your organisation	Dates (start/end)
Sustainable Buildings in The high North (SBHN)	Kolartic ENPI CBC program	€0.2 M	2012-2015

The main focus is on the energy efficient renovation of the prevailing building stock, especially multistory buildings in Norway, Sweden, Finland and Russia. The major objective of the SBHN project is to promote trade between the Scandinavian countries and Russia in the field of sustainable building industry. The project involve several partners: Narvik University of Applied Sciences, Norway Nordland University of Applied Sciences, Norway, Umeå University, Sweden, Oulu University of Applied Sciences, Finland, Murmansk State Technical University, Russia and industrial partners.

Umeå University is handling one work package which include comparison of building codes, regulations and methods for partner countries and verification methods for building energy performance.

Project name	Funded by	Budget involved for your organisation	Dates (start/end)
Increasing Energy efficiency in Buildings (IEEB)	Interreg IVA Nord Program	€0.21M	2010-2014

The purpose of the IEEB project is to create a Nordic network among academia, research, industry and society for developing new solutions and promoting energy efficiency in buildings. Finding new ways to plan and build more energy efficient buildings, contributes towards proactive sustainable development of the environment.

Funded by the EU Interreg 4A Nord programme, the IEEB project develops new competence and expertise in measurements and methods for advanced design of energy efficient buildings, picks up and documents the best practices and recommendations based on real-life information, and finally, transfers all the accumulated knowledge to building professionals and industry representatives, local building authorities and citizens, educators, equipment manufacturers and system providers.

The project involve several partners: Narvik University of Applied Sciences, Norway

Nordland University of Applied Sciences, Norway, Umeå University, Sweden, Oulu University of Applied Sciences, Finland, Murmansk State Technical University, Russia and industrial partners.

Project name	Funded by	Budget involved for your organisation	Dates (start/end)
New method for measurement of heat loss from buildings	Swedish Energy Agency	€0.3M	2015-2017

The project goal is to develop thermography into a method for imaging measurement of the heat flow rate (W/m^2) from the building envelope surface. The method enables on site measurement of the heat energy loss (kWh) from the envelope, and its thermal transmittance (U-value). Presently, only single point measurement of the heat flow rate is possible, while no reliable imaging method exist. For this reason, field measurements are rarely performed, and instead one relies mainly on computer simulations. It is well known that computed and measured results often differ significantly.

Recently, we published a laboratory study of the thermography method, where its error sources were identified. In the next project stage (this application), we first want to reduce the main source of error, using a supplementary measurement of the "convective heat transfer coefficient", and then demonstrate on site measurements under winter conditions.

Project name	Funded by	Budget involved for your organisation	Dates (start/end)
Sustainable Ålidhem	Building company	€0.13M	2010-2015

Ålidhem is a residential area in Umeå. Sustainable Ålidhem is a unique pilot project for sustainable urban development which involves social, technological, environmental and economic changes. The overall project goal is to reduce energy consumption in the area, create areas that are safer and more pleasant, and transform Ålidhem into a sustainable district. Refurbishing of 405 apartments is expected to reduce energy use by 40–50 %. Moreover, 137 new apartments have been built on Geografigränd. They have an energy consumption of 65 kWh/m² per year, which is about 50 % less than what is demanded according to current construction norm. A complex of photovoltaic cells that when finished will consist of more than 2800 m² - one of the largest in Sweden which is estimated to produce about 280 000 kWh every year.

One of the objective of the project is to evaluate the overall energy savings possibility in Ålidhem locality through the implementation of various energy efficiency measures in multi-family residential buildings. Energy performance of selected energy retrofitted buildings will be monitored over a long period to understand the implications of energy efficiency measures implemented in those buildings.

Relevant infrastructure

A. The Energy Laboratory

The energy lab is equipped with several equipment which include the following:

- Two air handling units for the conditioning of the ventilation air. One air handling unit has the rotating heat exchanger whereas the other equipped with the crossflow heat exchanger
- Advanced thermography cameras
- Two solar panels for hot water heating application
- Three hot boxes, which reproduce a room in scale
- A system of four panel radiator

B. Immersive interaction lab (i2Lab) :

Immersive interaction lab (i2Lab) is involved in human machine interaction (HMI) and physics of virtual environments, visual Interactive Simulation, 'Design-Build-Test'. The infrastructure includes availability to many software tools for computational science, engineering, hardware. The i2lab is involved in development HCI technologies and methodologies by inheriting knowledge from various sciences such as psychophysics, 2D/3D image processing, computer vision, applied electronics and engineering. At Umeå University, i2lab is involved in teaching bachelor program in interaction design and M.Sc. program in Robotics and Control. i2lab home page:

http://www.tfe.umu.se/forskning/i2lab/

Partner 11: University of Strathclyde

(US)

www.esru.strath.ac.uk



ESRU, established in 1987, is located within the Department of Mechanical and Aerospace Engineering at the University of Strathclyde in Glasgow. The group, comprises around 30 multidisciplinary researchers and addresses all aspects of built environment energy demand and supply, with research outcomes encapsulated within software tools for use in various contexts – such as building design, plant sizing/control, energy management, new and renewable energy systems deployment, and energy action planning. Members of ESRU have serviced a large portfolio of research funded by the EC, UK Research Council and industry. Most significant of these in the present context are the partnerships with Glasgow City Council resulting in the deployment of building-integrated renewable technologies within landmark buildings, the establishment of building upgrade quality assurance procedures based on pervasive sensing, and the development of opportunity maps to direct low carbon energy technology deployment across the city.

The group has a track record in commercialising its research outcomes, through spin-out companies and through industry collaborations enabled by the UK's Knowledge Transfer Partnership programme. To further facilitate the transfer of research outcomes to practice, ESRU services industry-oriented networks: the *BRE Centre of Excellence for Energy Utilisation* addressing prospects for introducing responsive energy demand within future cities and training the next generation of energy-aware practitioners; the *Construction Scotland Innovation Centre* helping to deliver energy-related innovation in the construction sector; the *Scottish Energy Systems Group* assisting organisations to embed energy simulation tools within their business; and *computational consultancy*, which provides specialist support to companies as required.

In addition to its research activities, the group delivers courses on energy and environment topics at undergraduate, postgraduate and continuing professional development levels and plays a leadership role in the University's *Doctoral Training Centre for Built Environment Futures*.

Further detail on ESRU research, publications, software tools, courses, training provision and consultancy services is available at <u>www.esru.strath.ac.uk</u>

Short CV of involved key researchers / staff

Professor Joe Clarke is Director of ESRU and the BRE Centre of Excellence in Energy Utilisation. He holds a BSc (Hons) in Environmental Engineering, a PhD in Energy Systems Modelling, and a DSc for 'Contributions to the Design and Deployment of Clean, Efficient Energy Systems'. A major focus of his research is the development and dissemination of software tools for energy systems performance assessment, and the application of these in design, research and policy contexts. He is a recipient of distinguished service awards from the Royal Society (for 'the development of the EC reference energy model and its dissemination through an innovative energy design advisory service'), the World Renewable Energy Network (for 'contributions to the promotion of renewable energy'), and the International Building Performance Simulation Association (for 'substantial contributions to the field'). He is Associate Editor for J. Building and Environment and Editorial Board Member for several Journals including J. Power and Energy and J. Building Performance Simulation. He is the progenitor of the MSc in Energy Systems and the Environment at Strathclyde.

Dr Nick Kelly is a Senior Lecturer in the Department of Mechanical and Aerospace Engineering and Associate Director of ESRU. He holds a BEng (Hons) in Environmental Engineering, an MSc in Energy Systems and a PhD focused on energy supply and demand. His research interests range from the analysis of demand for energy associated with the built environment, through to quantifying the need for demand reductions and supply transformation in meeting UK CO₂ commitments. His current research projects include the RCUK Grand Challenge Programme – a large collaborative project with multiple Universities researching the transformation needed in future energy networks to enable a low-carbon future. He is also involved in EC and EPSRC-funded projects focused on the use of IT and pervasive sensing in delivering human comfort and low carbon buildings. Dr Kelly's teaching interests reflect his research: he is responsible for delivering courses in electrical power systems, energy resources and policy and low-carbon building design.

List of relevant previous projects or activities, connected to the subject of this proposal

- 2016-19, EPSRC, Fabric integrated thermal storage in buildings and their interfacing with future networks.
- 2015-19, European Commission Horizon 2020 Programme, Highly innovative building control tools tackling the energy performance gap.
- 2015-17, Hurley Palmer Flatt, Software tools for urban hybrid energy systems sizing and performance assessment.
- 2015-16, Scottish and Southern Energy, Urban hydrogen production system optimisation.
- 2014-17, EPSRC, Pervasive sensing for collaborative facilities management.
- 2014-16, SP Energy Networks, Assessing the impact of low carbon technologies on the electricity distribution network in Glasgow.
- 2014-15, Glasgow City Council, Confirming the effectiveness of insulation retrofit measures applied to Glasgow housing.
- 2014-15, Glasgow City Council, Mapping opportunities for urban renewables generation.
- 2011-16, Scottish and Southern Energy, Active network control through the remote charging of domestic electric heaters and hot water tanks.
- 2011-15, EPSRC, Investigating demand and supply characteristics in future dwellings and development of a grid sensitive load shifting demonstrator.
- 2011-13, ScottishPower, Impact of electrification on the low voltage electricity network design.
- 2010-13, EPSRC, Transforming energy demand through digital innovation.
- 2009-13, EPSRC, Supergen HiDef: investigation of the impact of future changes in electricity demand on the local electricity supply infrastructure and an appraisal of the mitigating effect of future local microgeneration.
- 2009-13, EPSRC, Investigation of the impact of future changes in electricity demand and an appraisal of the mitigating effects of local microgeneration.
- 2007-11, EPSRC, SuperGen FlexiNet: Impact of demand side management techniques on users and future electricity supply networks.
- 2006-presen7, Building Research Establishment, Centre of Excellence in Energy Utilisation.
- 2003-7, EPSRC, SuperGen FutureNet: The role of demand-side management techniques within future electricity distribution networks.

Description of significant infrastructure and major items of technical equipment relevant to the project

No significant items to be planned

Large Infra structure

	Cost (€)	Justification
Large research infrastructure	0,00€	Not applicable

Partner 12: Brno University of Technology

(UB)

www.vutbr.cz



Brno University of Technology (BUT) is the second largest and second oldest technical university in the Czech Republic. In last 5 years, BUT has established 5 research centres to support cooperation between academia, industry and public bodies. The Centre of Sensor, Information and Communication Systems (SIX) belongs to those centres.

SIX actively participates in national research projects and European ones. Within H2020, SIX succeeded with ADWICE (Advanced Wireless Technologies for Clever Engineering) and CELTA (Convergence of Electronics and Photonics Technologies for Enabling Terahertz Applications). The project proposal INCOME (Intelligent Cover Materials for Airplane Electronics) is under evaluation.

Complex information on SIX is available at <u>www.six-centre.eu</u>

The research team of SIX comprises 100 full-time equivalents, approximately. The research team is divided into 7 groups (smart sensors, networked signal processing, smart transport, high-mobility communication, advanced cyber-security, advanced antennas and circuits, awareness in cyber-physical systems). Solved projects follow these 7 research lines, and their combinations.

CVs of involved key researchers / staff members

Prof. Zbynek Raida. Zbynek graduated at Brno University of Technology in electrical engineering. As a post-doc, he spent one semester at Université Catholieque de Louvain, Belgium. Zbynek is familiar with research and management of national projects (Czech Science Foundation, structural funds, grants of ministries) and European projects (FP7, H2020, COST). Zbynek is a founder of the SIX Research Centre.

Relevant publications, and/or products, services or other achievements

[01] MRNKA, M.; <u>RAIDA, Z.</u> Enhanced gain dielectric resonator antenna based on the combination of higher order modes, *IEEE Antennas and Wireless Propagation Letters*, 2016, vol. 15, p. 710-713. ISSN: 1536-1225.
[02] LÁČÍK, J.; HEBELKA, V.; VÉLIM, J.; <u>RAIDA, Z.</u>; PUSKELY, J. Wideband skin-equivalent phantom for V- and W-band, *IEEE Antennas and Wireless Propagation Letters*, 2016, vol. 15, p. 211-213. ISSN: 1536-1225.
[03] MIKULÁŠEK, T.; LÁČÍK, J.; PUSKELY, J.; <u>RAIDA, Z.</u> Design of aperture-coupled microstrip patch antenna array fed by SIW for 60 GHz band, *IET Microwaves, Antennas & Propagation*, 2016, vol. 10, no. 3, p. 288-292.
[04] PUSKELY, J.; POKORNÝ, M.; LÁČÍK, J.; <u>RAIDA, Z.</u> Wearable disc-like antenna for body centric communications at 61 GHz, *IEEE Antennas and Wireless Propagation Letters*, 2015, vol. 14, p. 1490-1493. ISSN: 1536-1225.

[05] ŠTUMPF, M.; <u>RAIDA, Z.</u> Pulsed electromagnetic waves between parallel plates: the modal-expansion and generalized-ray approaches, *IEEE Antennas and Propagation Magazine*, 2014, vol. 56, no. 6, p. 90-101. ISSN: 1045-9243.
ADWICE

CELTA

2015 - 2016

2016 - 2020

H2020

H2020

List of releva	list of relevant previous projects or activities, connected to the subject of this proposal				
Project acronym	Funding source/ period	Topic and website	Instrument		
SIX	2010 - 2013	http://www.six-centre.eu	Structural funds		
INWITE	2015 - 2019	https://www.vutbr.cz/en/research-and- development/current-projects/detail/25684	Czech Ministry of Education		

List of relevant previous projects or activities, connected to the subject of this proposal

Description of significant infrastructure and major items of technical equipment relevant to the project

http://www.adwice.org

http://www.celta-itn.eu/

Research infrastructure of the SIX Centre is fully described on web pages of the centre http://www.six-centre.eu

BRNO

Partner 13: Municipality of Brno

(Brno)

www.brno.cz

Participant profile

Brno is the second-largest city in the Czech Republic and a centre of the South Moravian Region. It has a strategic geographic position within Central Europe with excellent transport accessibility, including an international airport. Brno has a borderline oceanic climate and a humid continental climate with cold winters and hot to warm summers. The average temperature in January [°C] is 1.3°, while in August it is 19°.

Brno is a modern, dynamic and fast-growing centre of industry, trade, science, information technology, research and innovation with business incubators and centres of excellence in science and is annually visited by almost one million people. In addition of being a city of universities, Brno claims a high quality of life – a cultural centre, sports, historical sights, Villa Tugendhat – a UNESCO site, functionalist architecture, shopping centres and services for leisure time, and a beautiful natural environment.

Area (km2)230.22 Population376 561 (3Q/2016) Density (inhabitants/km2)1 640 Average GDP per capita - related to EU28 (%)133 (2013) Rate of unemployment (%)7.6 (29.2.2016)

The Municipality of Brno employs about 1,200 and in 2015 had a budget of approximately 12 billion CZK (approximately 330 million EUR). The main department that will be in charge of managing, facilitating and implementing the project is City Strategy Office.

City Strategy Office is in charge of strategic planning and actualization of main strategic development document Brno City Strategy. Brno City Strategy is a long-term binding document which exceeds horizons of electoral terms. It is a document which contributes to the further development of the city. It is based on five priorities fundamental for Brno - Image of the city and internal/external relations, Local economic development, Quality of life, Research, development, innovations and education, Transport and technical infrastructure. Besides this City strategy office cooperates with investors, universities and private companies; ensures economic promotion and marketing, gathers socio-economic and demographic data regarding city development, realizes sociologic researches, coordinates the Programme of knowledge economy development drafting and also the tourism development. City strategy office is dividend into the following departments: City strategy and regional cooperation department, Knowledge economy department, Legal-economic department and Marketing department. City strategy office has 30 employees.

Brno has its local smart city initiatives. The project will act as a springboard for Brno to improve those initiatives by sharing knowledge and receiving training in the specific areas. As of 2014 a Smart City Committee has been established to achieve smart city integration. The project will allow this Committee to further improve and establish itself. In 2016 the city is expected to define a 2050 vision, through the above Committee, which is already being developed using a participatory approach. Therefore one of the main priorities is a creation of holistic strategic document "Brno City Strategy" which will describe strategic development in the City of Brno in medium-long term horizon. Define and replicate smart solutions implemented by the lighthouse cities is main project task as well.

CVs of involved key researchers / staff members

Jakub Rybář (Male)

Role in the project: Management

Qualification: Head of Knowledge Economy Development Department in Brno City Municipality

Staff category: Head of Department

Short description of work experience, relevant to the proposal: Head of Knowledge Economy Development Department with 8 years experience with coordination of financing large scale infrastructure projects, Experience with cofounding Pre-EU funds, EIB loans, national subsidies. For seven years has worked in City Strategy Office with responsibility implementation of City Strategy, coordination of sector policies, and responsibility for coordinator of development policies, and R&D projects of Regional innovation strategy.

Lukáš Grůza (Male)

Role in the project: Project Team Member

Qualification: Smart City coordinator in Brno City Municipality

Staff category: Senior project coordinator

Short description of work experience, relevant to the proposal: Lukáš Grůza is currently employed in Brno City Municipality in position of Coordinator for Smart City. That means he is responsible for implementation of Smart Cities approach across all relevant agendas in the city. After obtaining a master's degree in Ethnology at the Masaryk University (2010), he began working in NGO sector collaborating in several European projects. He has also experience with public administration and European projects administration from a position of a mayor

Jaroslav Kacer (male)

Role in the project: Smart City Expert

Qualification: Chairman of the Smart City Committee, Transportation Expert

Staff category: Senior project expert

Short description of work experience, relevant to the proposal: Currently Chairman of the Smart City Committee with extensive experiences from the past such as -Consultant and Analyst for the Implementation of EU ESF projects (Employment office of the Czech Republic, the Branch office of the South Moravian Region); -Deputy Director of Further Education Fund (Ministry of Labour and Social Affairs of the Czech Republic); - Expert on Cohesion Policy (Ministry of Education, Youth and Sports of the Czech Republic).

Marek Janíček (Male)

Role in the project: Smart City Expert

Qualification: Chairman of the Smart City Committee, Energy Expert

Staff category: Senior project expert

Short description of work experience, relevant to the proposal: Member of the City Council responsible for Smart City. Responsible for communication with city companies.

Relevant publications, and/or products, services or other achievements Program to Improve Air Quality of Statutory City of Brno, ENVIROS, s.r.o. a kol., 2012 Smart City Concept, City Strategy Office, 2015 Electro mobility - Feasibility Study, Transport Research Centre, 2014 General plan for public transport in the City of Brno, CITYPLAN spol. s r.o., 2012 SCC-1-2016

			•
Project acronym	Funding source/ period	Topic and website	Instrument
CIVITAS - ELAN	FP7 2008 - 2012	ELAN project takes an approach where "Putting the citizen first" is at the core of the work. Implementing sustainable mobility that gives priority to citizens and their quality of life. <u>http://civitas.eu/content/elan</u>	Collaborative projects
CIVITAS - 2MOVE2	FP7 2012 - 2016	2MOVE2 will further advance the knowledge of innovative, integrated urban transport systems, provide networking for cities to assimilate best practice, evaluate impacts and disseminate results. http://www.civitas.eu/content/2move2	Coordination and support actions
TROLLEY	INTERREG IVB CENTRAL EUROPE , 2010-2013	TROLLEY contributes to an improved accessibility of, and within, Central European cities, focusing on urban transport. By taking an integrated approach the project has one main aim: the promotion of trolleybuses as the cleanest and most economical transport mode for sustainable cities and regions in Central Europe.	
JOINING FORCES - URBACT II	URBACT II, 2008 - 2010	JOINING FORCES aims at exploring how strategy making and governance arrangements at city-region scale can help to effectively address the main challenges faced by urban Europe: competitiveness, cohesion, and sustainability.	

List of relevant previous projects or activities, connected to the subject of this proposal

Description of significant infrastructure and major items of technical equipment relevant to the project Not applicable

Partner 14: Municipality of Parma

(Parma)

www.comune.parma.it



Parma is located in the Emilia-Romagna region, halfway between Milan and Bologna. Because of its continental climate, seasons are moderate; the average temperature in January is 0.9°C and in August it is 24°C. It is a vital town rich in history, art and culture and it is the seat of the oldest university in Italy.

Parma is the capital of the so-called "Food Valley": the city specializes in the food sector and the local food industry consists of handicraft firms, small enterprises and big industries. Since 2004 Parma has been home to the European Food Safety Authority (EFSA). In 2015 it was designated Unesco Creative City for Gastronomy.

The Municipality of Parma is a local public body whose mission is to represent, care of and promote the development of the local community. It defines and applies policies, strategies and action plans in the following fields: social, families, housing, education, transport, culture, tourism, urban planning, energy, local economy, ICT for better and more efficient public services. It employs aprox 1.300.

Parma will act in RUGGEDISED as follower city with the aim to accelerate the city's sustainability and innovation; to this aim, it will implement the tasks assigned to follower cities as described in the project proposal.

Parma scores high in national smart city rankings, coming 5th among the Italian smart cities (Report Smart City Index 2016 "Italia Smart", EY), and 10th in the 2014 *lcityRate* amongst the 106 Italian cities analysed in the smart city report. In 2015 it was ranked 12th among 104 Italian cities in the Ecosistema Urbano, report on the urban environment quality and performance of local public administrations. In 2014, Parma came in as 2_{nd} best in the Euromobility (Italian Observatory of sustainable mobility) ranking of sustainable mobility in Italy. A 2014 report on *Fair and sustainable well-being in cities*, ANCI (National Association of Italian Cities) placed Parma as the 3_{rd} best Italian city. Again in 2014 Parma placed 1_{st} in a national contest on *Municipalities towards zero waste* organized by the WWF and other national environmental associations. Parma is also recognised in sustainable urban logistics, being the recipient of the 2010 *SUGAR Award* for the implementation of the ECOLOGISTICS project, aiming to rationalise the distribution of diverse goods. Finally, in 2009 Parma received the *Juice Award* for its technological innovation in providing online services to citizens.

The Municipality of Parma is a member of the following European networks: Energy Cities; Endurance, European SUMP network; EUniverCities; National Smart City Observatory; CIVINET - CIVITAS City Networks; Parma has signed the Malaga charter in 2013 (sustainable urban planning models).

The departments wich will implement RUGGEDISED are:

- 1. Mobility and Environment: 25 people; the main current actions relevant to smart city are: preparation of the SUMP; upgrade of the public transport network: increase and upgrade the infrastructure for electric mobility (recharging units for electric cars), increase car sharing and car-pooling, increase the bike sharing parkings; increase the modal split and the integration with regional transport system (railway); improve the electronic control of bus routes; improve the public transport among the city and the suburban areas; the new plan for the mobility of disabled people.
- 2. Energy: 6 people work for reaching the objectives and the expected results of the SEAP in the areas: buildings (private, public, schools, social housing), enterprises and the integration with transport and mobility.
- 3. ICT: 16 people work towards two objectives: to increase efficiency through innovation in the software, hardware and organization of the Municipality; to make public services for the city more accessible and efficient.

These departments will be supported by the EU funding unit of the Municipality.

CVs of involved key researchers / staff members

Enzo Bertolotti, Arch, M.sc. (Male) - Head of the Energy Office of the City of Parma and Energy Manager since February 2013. Head of bureau in the environment department from 2001 to 2012. Consultant KlimaHouse since 2010; technician in acoustic since 2006; expert in environment assessment systems since 2005; expert in geographic information system (GIS) since 2002. Degree in architecture and Master in Urban and environmental planning, Politecnico Milan, 1999.

Nicola Ferioli, Eng (Male) – Director of the department Environment and Mobility. Extensive experience in project management and engineering design for enterprises and public administration; previous experience as Court-appointed technical consultant, technical director of Infomobility Spa, technical director of maintenance, traffic works.

Emanuele Filippi, Eng (Male) - Responsible of the sustainable mobility division. Senior expert in mobility, transport planning and sustainable mobility. Since 2001 expert in the Municipality of Parma for traffic monitoring systems, cycling, quality for mobility. Degree in civil engineering with specialisation in protection and conservation of the territory, University of Parma, 1999.

Paolo Fontechiari, (Male) - Responsible of the office Technological innovation and ICT in the ICT department. Responsible for many projects of e-government and digital agenda in the Municipality of Parma. Experience in networks, data processing centres, electronic identity card, ICT outsourcing, etc. More than 20 years of experience in IT project management and ICT.

Silvano Carcelli, Arch (Male) – Director of the department Public Works. Previous experience as manager of the department development and management of the territory, with extensive experience in public buildings, building restoration, restoration after earthquake. Degree in architecture, University of Florence, 1980.

Relevant publications, and/or products, services or other achievements

- SEAP, approved in 2014
- SUMP guidelines approved in 2015
- eGovernement: variable message boards (VMB) providing information on traffic, parking, Limited Traffic Zone, buses.
- Traffic Sensors: real time traffic monitoring network consisting of measuring stations (SRT) positioned within the municipal area.
- Apps: GiroParma: mobility information in real time; Easypark: parking payment system through phone, tablet or PC.

Project acronym	Funding source/ period	Topic and website	Instrument
Infinite Solutions - INnovative FINancIng for Local SusTainable Energy Solutions	Intelligent Energy Europe – call for proposals 2013. 2014 – 2017 <u>http://www.energy-</u> <u>cities.eu/spip.php?page=infi</u> <u>nitesolutions_en</u>	Replicate in 9 local authorities in Europe the experiences of revolving funds for internal energy performance contracting (intracting) on public buildings as well as soft loans for housing renovation, which have been successfully implemented in Stuttgart and Delft.	The revolving fund for energy efficiency in private residential sector (mainly condominiums) can support actions for smart city in private buildings
Freight TAILS - delivering Tailored Approaches for Innovative Logistics Solutions	Urbact Action Planning Network – call for proposals 2015. 2015 – 2018 Website under preparation.	It addresses the challenges posed by rapidly increasing freight movements, within the context of all urban logistic. It will develop tailored freight management policies using the URBACT Integrated Action Planning methodology to pro-actively support the functioning of different growing cities, whilst reducing the carbon emissions associated with urban freight transport, and stimulating the low carbon urban freight sector.	The action plan for logistic, that will integrate policies, solutions and actors, will also be connected to the smart city actions.

List of relevant previous projects or activities, connected to the subject of this proposal

Description of significant infrastructure and major items of technical equipment relevant to the project

- New infrastructure of smart public lighting of the city under implementation
- New Datacenter for the City of Parma, other local public administrations and private bodies (cloud services, storage, disaster recovery, backup, business continuity); in cooperation with the regional public authority
- 135.000 Smart meters (electric); 1.643 Smart meters (gas)

Partner 15: Municipality of Gdansk



<u>www.gdansk.pl</u>



Participant profile

The City of Gdansk with the population 461 935 (30.06.2014) belongs to the group of largest cities in Poland (262 km²) and plays a role of a capital of the Pomorskie Voivodship and a heart of political, economic and social life of the regional community numbering nearly 2 million inhabitants. The City of Gdansk is realizing tasks of both commune and county. Therefore, the City of Gdansk has the responsibility for all public matters of local significance: education, public health promotion and protection, social welfare services, family support policy, assistance to the disabled, employment, maintaining public order and collective security, maintenance of county facilities and public utilities, local infrastructure, electricity and heath supply, public transport, fire protection, supporting cultural institutions, sport and tourism, constructing and maintaining roads, environmental protection, municipal housing. The legislative authority of the City of Gdansk is performed by the City Council, which consists of 34 members. The mayor of Gdansk, elected in direct elections, is the executive authority. The mayor exercices direct general supervision over managing the municipal property and the property entrusted to municipal management, organization and functioning of the municipal office, security and public order, civil defense and emergency conditions.

Major effort of the city of Gdansk is allocated in WP7 in order to participate in networking and knowledge transfer activities related to smart solutions (T7.1) and establish smart city governing group that will be responsible for continuous cooperation with the consortium (T7.2). Gdansk will further work on a vision of sustainable deployment of energy-mobility-ICT innovations (T7.3) and finally design final replication plan (T7.4). Moreover, Gdansk will be also involved in required communication activities to promote the project and its outcomes (WP9).

The City of Gdańsk has in its structure substantive departments, which for many years perform international cooperation projects devoted to various topics. These projects cover issues related to improving energy efficiency, reducing CO2 emissions, implementing innovative activities in the field of active mobility and the use of ICT tools in the management of various sectors of the city. The project team members have extensive experience in project management in the public sector. The experience of the project team applies in particular to project settlement, organizing events, seminars, study visits, etc.

CVs of involved key researchers / staff members

Joanna Tobolewicz (female) – graduated from Moscow Institute of Energetics (currently: National Research University, "Moscow Power Engineering Institute") where she specialized in nuclear plant technologies and from Koźmiński University of Economics in Warsaw. She has 20 years of working experience in fuel and energy industry and is certified project manager (PRINCE2 Practitioner, M_o_R Foundation, MSP Foundation) who participated in several European projects. Currently she is with the City Hall of Gdansk where she acts as Chief Energy Officer.

Barbara Szymańska (female) – she graduated from the University of Gdansk where she specialized in numerical mathematics and programming. She also studied controlling in enterprise management. For 6 years now she has been managing the IT Department in the City Hall of Gdansk where she also acts as Chief Open Data Officer. Before, she has gained experience working in several industrial companies in ICT domain. She is certified auditor for ISO 27001 norm on information security. Mrs. Szymańska is also an active member of Chamber of Experts at Polish Information Processing Society.

Joanna Zbierska - her background is French language and management of the EU projects, most recently she graduated from the National School of Public Administration. Joanna has rich experience in work for the local self-government. She specializes in the successful realisation of complex projects within the framework of such EU programs and funds as the 5th Framework Programme, Interreg IIIB, Interreg IIIC. MedPact, Interreg IVC, South Baltic, 7th Framework Programme, Intelligent Energy Europe, Lithuania – Poland Russia.

Małgorzata Jagielska (female) – graduated from Gdańsk University of Technology (Faculty of Architecture) and University of Warsaw (Faculty Law and Administration). Since 2007 she has worked for the central government administration as a planner and coordinator of PPP projects in the field of technical issues. Now she works for Gdańsk City Hall as a project manager. She participated in the preparation of partnership projects, particularly public-private partnership in the sector of public utilities and transport.

Project acronym	Funding source/ period	Topic of the project / activities	Relevance and link to RUGGEDISED
MIMOSA	7FP TREN/FP7/TR/2 18953/CIVITAS MIMOSA 2008-2012	Making Innovation in Mobility and Sustainable Actions – Gdansk carried out several coordination, networking, and innovation activities in areas of mobility management, intelligent transportation systems, car-independent lifestyles, transport telematics, and integrated planning.	collaborative project
Central Meetbike	Central Europe 3CE343P2 2011-2014	Central Meetbike – Gdansk has been involved in several activities in the field of integrated promotion of bicycle transportation	collaborative project
CYCLECITIES	INTERREG IVC 13007R4 2012-2014	European cities for integrating cycling within sustainable mobility management schemes – Gdansk participated in networking activities that aimed at know-how exchange in the domain of sustainable development of bicycle mobility.	collaborative project
Streetlight-EPC	IEE/13/399/S12 .675823 2014-2017	Triggering the market uptake of energy performance contracting through street lighting refurbishment projects – Gdansk is involved in activities for innovation in outdoor lighting solutions.	collaborative project

List of relevant previous projects or activities, connected to the subject of this proposal

Description of significant infrastructure and major items of technical equipment relevant to the project No significant items planned.

Large Infra structure

Not applicable.

Partner 16: Ballast Nedam Bouw & Ontwikkeling Holding B.V.



www.ballast-nedam.nl

Ballast Nedam's customers' needs are in housing, mobility, energy and nature, which are our four areas of work, and together they encompass the entire living environment. Ballast Nedam concentrates within these areas of work on major integrated complex projects and related activities in the niche markets of industrial construction, offshore wind turbines, secondary raw materials and alternative fuels.

During the Hart van Zuid project Ballast Nedam acts as an integrated developer of the Zuidplein and Ahoy area. Ballast Nedam created the urban plan and is designing the buildings. Ballast Nedam will not only build and finance the buildings and the public space, but is also responsible for maintenance of the entire area for a period of 20 years.

Short CV of involved staff

Mr. Felix Sanders (M.Sc.). Felix has a Master degree in Real Estate Management (Technical University of Delft). He is as senior project manager responsible for the zoning plan, for the urban design and for management of all the links between design of the buildings and design of the public space.

Mr. Hans Wildeboer (M.Sc.). Hans has a Master degree in Business Administration (Technical University of Twente). He is responsible as senior project manager for the design and construction of the main buildings within the project scope (Conference center, venue hall, swimming pool and theatre).

Mr. Jan Theelen (M.Sc.). Jan has a Master degree in Civil Engineering. Administration (Technical University of Twente). His main responsibility in the Hart van Zuid project is managing the interfaces between the project itself and the legal and financial aspects of the project.

Mr. Peter Klevering (M.Sc.). Peter has a Bachelor degree in Construction Engineering and Master Degree in Business Administration. In his role as project director he is responsible for the Hart van Zuid project.

Project acronym	Topic and website
Avenue2, Maastricht	Construction of a highway tunnel in combination with the area development on top of the tunnel. (<u>www.avenue2.nl</u>)
Berckelbosch, Eindhoven	Area development including the construction of approx. 900 houses (<u>www.berckelbosch.nl</u>)
Leidsche Rijn, Utrecht	Large scale area development, consisting of a total of 35.000 houses.
Amsterdam Arena	Area development around and including the Amsterdam Arena.
Foodcenter Amsterdam	Area redevelopment of a former fresh-foodmarket in high-end housing area (<u>www.foodcenter.nl</u>)

List of relevant previous projects or activities, connected to the subject of this proposal

Description of significant infrastructure and major items of technical equipment relevant to the project No significant items to be planned

Partner 17: Rotterdamse Elektrische Tram N.V.



(RET)

www.ret.nl

RET NV is a Dutch public transport company, providing public transport services in Rotterdam and its periphery. RET is the main operator of public transport for bus, tram and subway in the area of the Rotterdam city region. RET operates 8 subway lines, with 152 vehicles and ten tramway lines, with 118 vehicles. RET also transports passengers over water by ferry. The ferry sails between Hoek van Holland and the port at Maasvlakte. Since December 2012 the service area for bus increased with 40% thanks to winning a bus concession for Rotterdam and the area surrounding the city. The services are provided by 256 busses. Most are equipped with Euro V or EEV engines; four are parallel hybrids, one is fully electric. RET has about 2.750 employees, about 700 of them are working for the entity RET Bus BV.

After a large scale introduction of Euro V and EEV vehicles in 2007, pilots with electric hybrid powered vehicles in 2010 and introduction of electric company cars in 2012, RET will introduce full electric vehicles powered by hydrogen in 2017. In this project RET will share knowledge on sustainable public transport in an urban environment and contribute to research and demonstrate innovative charging facilities at one of its major transport terminals. Also using smart sustainable techniques at the terminal itself and passenger information and management systems are also interesting subjects for RET. In this project we will also look at safety issues concerning hydrogen vehicles at such a terminal.

Sustainability has been part of the RET strategy since 2007. In that year we signed an agreement with the Rotterdam Climate Initiative in order to provide more environmental friendly public transport. The department Regie & Ontwikkeling (R&O), the strategy department, has experience with several European innovation projects. Between 2010 and 2014 RET has participated in the Ticket to Kyoto consortium. Five European public transport companies that joined forces in a four-year Interreg IV-B project to reduce CO2 emissions in public transport through more environmentally friendly behaviour and changes in infrastructure. The goal was introducing the principle of low CO2 emissions as a new standard for public transport providers. Coordinated by R&O, several technical and operational departments were closely involved in the project. The company also was partner in the TramStore21 project which was aimed at building sustainable tram depots in the 21st century.

CVs of involved key researchers / staff members

Mr. Virgil Grot (MSc) is senior advisor business development and sustainability at RET. He was the local coordinator for two European (Interreg IVB) projects concerning sustainable public transport, is the main contact for the company's sustainable activities and he is developing the corporate social responsibility agenda. Prior to working in public transport he was a grant consultant for medium sized and large multinational companies.

Mr. Theo Konijnendijk (MSc) is coordinator innovation and product development. He is responsible for sustainable development and European projects like the Horizon 2020 hydrogen busproject.

RET specialists

RET will involve several technical specialists from the departments engineering, fleet management, infrastructure management, planning and exploitation (BBE) and RET Bus BV.

Relevant publications, and/or products, services or other achievements

Publications:

- 2013: "Building sustainable and efficient tram depots for cities in the 21st century" <u>www.tramstore21.eu</u>
- 2014: "Reducing carbon, energy and costs in public transport" www.tickettokyoto.eu

Achievements:

- First metro line operator in the Netherlands in 1968
- Biggest transport company in Rotterdam area
- 2002: First transport company in the Netherlands to introduce the public transport chip card
- 2014 Introduction of the OV miles customer saving system based on travels with the chip card
- 2015 introduction free WIFI in every metro and tram vehicle

List of relevant previous projects or activities, connected to the subject of this proposal

Project acronym	Funding source / period	Topic of the project / activities	Relevance and link to AEM
TramStore21	Interreg IV-B	Sustainable tram depots	Lighthouse project for building sustainable tram depots and sustainable transport in general.
Ticket to Kyoto	Interreg IV-B	CO2 reduction in public transport	Strategy and demonstration of energy saving in public transport
3EMOTION	FP7 - Fuel Cells Joint Undertaking	Environmental Friendly Efficient Electric motion, Hydrogen buses	Input for the fuel lab and e-mobility
CIPTEC	Horizon 2020	Innovative solutions for public transport growth	Innovative customer orientation, operational service concepts and synergies between transport modes

Partner 18: ENECO

(ENE)

www.eneco.nl



Eneco provides more than two million customers with consistent, secure energy supplies. For this reason, we ensure that we can contribute value throughout the entire chain. We are an integrated energy group with more than 7,000 employees, offering comprehensive solutions for, and together with, our customers and partners. We invest in well-maintained networks, onshore and offshore wind farms, solar energy projects and biomass plants. And we are doing this from bases in the Netherlands, Belgium, the UK, France and Germany. We opt for a future which is completely centred on sustainability.

Our main tasks within the Hart van Zuid project will lay within the following:

- 1. Using a self-developed ICT-platform which automatically analyzes building information data from open platform building management systems, we'll optimize the energy consumption of buildings and increase the comfort-level within those buildings. This platform also make it possible to interact between the different buildings in the Hart of Zuid area.
- 2. We'll be responsible for the exploitation of the Thermal storage system, which provides a substantial part of the thermal energy demand in the area.
- 3. Realisation and exploitation of solar panels. We'll install solar panels on large roofs which via what is called "postcode area arrangement" will become property from local residents. Eneco calculates the annual offset of the power generated and the discount of Energy Tax.

Since two years we have are developing our own ICT-platform as described. With a team of 15 members we are innovating constantly to improve our service. Till about february 2016 we have installed the system in 50+ buildings (bigger than 5.000 sq. meter), were we realized an average energy saving of 15%-20%.

As Eneco we do have 40+ years of experience in the distribution of thermal energy and district heating. As of the last 15 years we have a division with 25 team members, specialized in thermal storage. We have different large thermal energy projects, as the Smart Grid on the Wilhelminapier in Rotterdam and the Thermal Smart Grid in the city center of The Hague. We are also responsible for exploiting three of the biggest heating networks in the Netherlands.

Currently Eneco is in the top-3 of solar-operators in the Netherlands. Our solar team consist of appr. 30-40 members.

CVs of involved key researchers / staff members

Tim Rijkhoek (m): Sustainable Energy Developer (Eneco)

Tim has ten years' experience as a project developer of the built environment. First as a developer of large commercial buildings and the last 5 years at as a developer at Eneco. Here he is responsible for area development with the focus on sustainable energy. His goal is to minimize the non-sustainable energy-use in an area through add more renewable energy sources. He does this for example through the exchange of thermal energy between buildings, solar energy, shallow geothermal, etc. Recent successes include the completion of the Maaskoudenet on the Wilhelmina Pier in Rotterdam and the Smart Thermal Grid in the city-center of The Hague.

Project acronym	Funding source/ period	Topic and website	Instrument
Koudenet Wilhelminapier	2013-2016	Cold Smart Grid: <u>http://nieuws.eneco.nl/ook-nieuwste-</u> rotterdamse-woontorens-boston-en-seattle-straks- gekoeld-met-water-uit-de-langsstromende-maas	Thermal Smart Grid
Smart WKO-grid The Hague	2010-2016	Smart Thermal Grid: https://www.youtube.com/watch?v=0oILyx0zFTg	Thermal Smart Grid
Smart Building system NH	2016	https://www.eneco.nl/grootzakelijk/gebouwmanager/	Smart Building Management System
Postcoderood Woerden	2013	http://nieuws.eneco.nl/inwoners-woerden-hebben- primeur-van-nieuwe-regeling-voor-zonnepanelen-op- andermans-dak	Solar

List of relevant previous projects or activities, connected to the subject of this proposal

Description of significant infrastructure and major items of technical equipment relevant to the project

- The district heating network (already working) for distributing waste heat

- The WKO Smart Grid infrastructure needed for distributing and exchange heat and cold in the area

Partner 19: KPN

(KPN)

www.kpn.com



Participant profile

KPN is the Dutch incumbent with its own fiber and copper networks in the fixed domain and 2G/3G/4G networks in the mobile domain. Currently, KPN is rolling out the first LoRa network that will have total national coverage. LoRa will act individually and alongside the other mobile networks and is especially suited for IoT and Smart City solutions. KPN is Dutch market leader on both mobile and fixed connections within the business market and consumer market. KPN provides millions of clients with different products and services. KPN takes in an enabling position in the Internet of Things and Smart City marketplaces. With its focus on collaborating with ecosystem parties (from start-ups to corporates) and matching demand and offer in the market, from niche players and specific unique customer demands to general solutions and maturing market opportunities, KPN has a dominant local presence in all customer segments in The Netherlands and therefore is the Dutch go-to party that boosts the Internet of Things and Smart City marketplace in The Netherlands.

Within the RUGGEDISED project KPN will contribute the following: Data transport on fiber, copper and LoRa; data storage via Cloud NL in own data centers; real time data analysis with Hadoop (big data management); interactive video delivery and data assurance with identity security measures.

CVs of involved key researchers / staff members

Dennis Groot (male): is a Data management Portfolio Manager in KPN's IT Services department. His goal is to facilitate trusted and broadly accepted data hub's that enable information creation between two or more organizations. He is and have been involved in several projects:

- Product development Data Services Hub
- Product development Guide in Big Data
- Member of the KPN Smart City development group
- 2014 Datatopia Data gets an attitude Gartner, co-author

Mr. Pim Stevens (male): is the KPN program manager of the 3 Smart City initiatives with the municipalities of Amsterdam, Rotterdam and The Hague. Besides that he runs the strategic partnership of KPN with the Amsterdam ArenA. Spotting IoT changes, building up smart cases and responding on Smart City challenges of the mentioned municipalities is the core of his work.

Mr Pepijn Nabbe (male): is an IoT Business Developer in KPN's Communication & Network Services department.n He holds an MScBA in Strategic Management from Rotterdam School of Management. His goal is to create and deliver the IoT infrastructures that enable meaningful applications. He is and have been involved in several (international) projects:

- Proof of Concept Development for Smart Cities and Smart Factories
- Development KPN Sense Concept Smart City Sensor Network
- Founder IoT Academy
- 4G Tactical roll-out Team

Relevant publications, and/or products, services or other achievements

- Lora Alliance: <u>http://www.businesswire.com/news/home/20150106006888/en/CORRECTING-REPLACING-LoRa%E2%84%A2-Alliance-Enable-Worldwide-Mobility#.VPWQKXyG-So</u>
- Amsterdam Smart City PPE: <u>http://zakelijke-community.kpn.com/t5/ICT-as-a-service/Innovatieplatform-</u> <u>Amsterdam-Smart-City-wordt-uitgebreid-voor-de/ba-p/1230</u>
- EU Smart Cities and Communities initiative Eindhoven: <u>http://www.iao.fraunhofer.de/lang-en/business-areas/mobility-and-urban-systems-engineering/1112-eu-sponsors-sustainable-city-concepts.html</u>

List of relevant previous projects or activities, connected to the subject of this proposal

- KPN is partner in the EU funded Triangulum project under SCC-1: <u>http://www.triangulum-project.eu/</u>
- First M2M PVNO deployment worldwide needed to support nationwide Smart Meter deployment.
- First M2M 4G deployment needed to enable the increasing demand for high bandwidth IoT Applications like Video surveillance.
- Co-Founder of Lora Alliance needed to introduce a strong international standard for Long Range, Low Power IoT Connectivity
- Co-Founder of Amsterdam Smart City PPE needed to involve Citizens in the deployment of meaningful IoT Applications in Metropolitan Areas
- Co-Founder of IoT Academy connect the IoT Maker/Developer community to other business functions to Discover, Make and Use IoT Technology

Description of significant infrastructure and major items of technical equipment relevant to the project

- KPN's LORA network
- KPN's fiber or copper network
- KPN's mobile networks (2\$-3G-4G)
- Cloud NL storage
- (KPN Hadoop Data analytics)

Large Infra structure

	Cost (€)	Justification
Large research infrastructure	not applicable	not applicable

Partner 20: Akademiska hus AB

(AHAB)

www.akademiskahus.se



Akademiska Hus AB is a limited state-owned property company with a turnover of EUR 580 million, a property value of EUR 6 300 million and a managed area of 3,1 million sq. m which make us Sweden's second largest property company - 300,000 people study, research and work in our properties on a daily basis.

We own, develop and manage property for universities and colleges, placing the emphasis on education and research, and running its business accordingly. Business is conducted on a commercial basis and generates a market return by setting rents that are in line with business risks. AH will work for the sustainable long-term development of academic campuses. We create campus environments that offer many different places to meet, to encourage collaboration and the sharing of knowledge.

Acting sustainably and for the long term comes naturally to us. As a state-owned company we work to the guidelines laid down by the state ownership policy, in which sustainable enterprise forms a central part:

- Among property companies we are one of the leaders in using energy more efficiently. Smart technical solutions give a growing share of our buildings very low energy consumption.
- By 2025 we intend to halve the amount of energy we buy compared to the year 2000.
- By investing in origin-marked electricity that is generated from renewable sources, such as hydro and wind power, we also ensure that the electricity we need to buy has been produced sustainably.
- We will reduce emissions of carbon dioxide that are generated during the operation of our properties.
- By working closely with universities and colleges we build a better understanding of how campuses can be made more sustainable.
- We collaborate with clients, contractors and suppliers that have good control, transparency and business ethics.
- Together with our colleagues we work actively to improve equality, diversity and accessibility for individuals with physical disabilities, and to combat discrimination.
- All the properties we build have to meet the requirements of the Swedish Miljöbyggnad environmental certification system.
- As one of the founders of the Sweden Green Building Council we help to spread knowledge and promote common issues in energy efficiency and environmentally aware building.
- Certified to environmental management standard ISO 14001 and Swedish work environment standard AFS 2001:1.

Short CV of involved key researchers / staff

David Carlsson (Male)

Role in the project: Coordination

Qualification: M.Sc. Computing Science, Umeå University, EMBA Financial, Stockholm School of Economics Staff category: Regional director

Short description of work experience, <u>relevant to the proposal</u>: Regional director Uppsala and North region, 110 employees, properties of 1 million square meters, turnover of 100 MEUR. Head of property management

Fredrik Nyberg (Male)

Role in the project: Energy engineer/Coordination Qualification: B.Sc in Energy engineering, Umeå University Staff category: Technical manager Short description of work experience, <u>relevant to the proposal</u>:

- Energy strategist
- Project manager
- HVAC designer

Experience of energy management, environmental management, energy mapping, advanced HVAC system design.

SCC-1-2016

Patrik Holmgren (Male)

Role in the project: Energy engineer Qualification: B.Sc in Energy engineering, Umeå University Staff category: Energy engineer Short description of work experience, <u>relevant to the proposal</u>:

Energy consultant at the company WSP Sweden for 10 years

- Lecturer at Swedish Energy Jurisdiction, session for Energy efficiency

Olov Bergström (Male)

Role in the project: Property development Qualification: Technical college graduate Staff category: Property developer Short description of work experience, <u>relevant to the proposal</u>:

- Property developer and project manager at Akademiska Hus since 2011.
- Construction manager at White Architects 2008-2011
- Participant in "Bygg i trä" EU-financed project 2004-2007 developing a new building system in wood combining volumes and elements.

Relevant publications and/or products/service

Akademiska hus has experience from and is involved in a number of large scale energy projects, new buildings and refurbishments, for example:

Geothermal energy system, Karlstad University

- Ground source geothermal system replaces district heating
- Drastically reduces carbon dioxide emissions
- Energy use can be reduced by 70 per cent
- Campus that is unique in Europe In operation in 2014

Albano, Stockholm

- Creation of an entirely new campus district
- Socio-economic urban planning
- Planned on nature's terms and supported by anthropological research
- Includes ecosystem services

Description of significant infrastructure and major items of technical equipment relevant to the project

Not applicable

COUNTY COUNCIL

OF VÄSTERBOTTEN

Partner 21: Västerbotten County Council



www.vll.se

Västerbotten county council coordinates three hospitals in Västerbotten: The University Hospital of Umeå, Lycksele Hospital and Skellefteå Hospital.

THE UNIVERSITY HOSPITAL of Umeå is the regional hospital for the Northern Health Care Region. The hospital's three primary tasks are to perform qualified medical care, research and training. It is Norrland's largest workplace with 5,700 employees.

The University Hospital of Umeå has a high level of expertise and advanced technological equipment, and offers regional medical care to patients with rare and complicated illnesses and injuries. Thanks to the regional medical care, the doctors and nurses retain their skills and expertise by treating complicated or unusual illnesses in a sufficiently large number of patients.

The University Hospital of Umeå is the only hospital north of Uppsala which trains doctors, which is of great importance in fulfilling the need for doctors to Northern Sweden. Qualified research is also being conducted here.

The University Hospital of Umeå reports the best survival rates in the world for patients with skull injuries. There is a unique aviation medicine expertise here and the neonatal intensive care provides the model for the entire country. Our genetic testing and treatment of young people with hereditary heart diseases can turn Umeå and the Centre for Cardiovascular Genetics into a unit for national medical care.

Västerbotten County Council will participate in the project with work connected to its properties and transport in the University city innovation area.

Short CV of involved key researchers / staff

Ulf Widmark (Male)

Role in the project: Coordinator

Qualification: Technical college graduate

Staff category: Head of Property management

Short description of work experience, relevant to the proposal: Managing county council of Västerbottens properties with 90 employees, properties of 550 thousand square meters, turn over 50 MEUR

Hans Johansson (Male)

Role in the project: Energy coordinator at County Council

Qualification: Mechanical engineer, Högskolan Härnösand

Staff category: Energy coordinator

Short description of work experience, relevant to the proposal:

Previous coordination, County Council of Västerbotten, 2013-present:

- Head project manager for energy projects, Contractor, Caverion AB, Umeå, 2011-2013
- District manager for HVAC and electric services, Akademiska hus AB, Umeå, 1993-2011
- Real estate manager, 2000-2011
- _ Energy/mechanical engineer, 1993-2000

Jakob Odeblad (Male)

Role in the project: Project coordinator at County Council Qualification: M.Sc. Engineering Energy, Umeå University Staff category: Property Area Manager Short description of work experience, <u>relevant to the proposal</u>: Previous coordination, County Council of Västerbotten, 2011-present:

- Energy planning
- Head project manager for energy projects
- Responsible for implementation of Energy Management System according to ISO 50001
- Energy consultant, Sweco Systems AB, Umeå, 2007-2011
- Energy mapping of buildings and industry
- Energy system design, early stage
- Energy calculations in design phase
- Master thesis, AstraZeneca AB, Södertälje, 2006-2007
- Mapping and optimisation of cooling system

Description of significant infrastructure and major items of technical equipment relevant to the project

Not applicable

Partner 22: Umeå energi AB

(UEAB)

www.umeaenergi.se



Umeå Energi is an energy and communications group with business units dealing with supplying Heating, Electricity supply, power trading, renewable production with wind and solar power, broad band communications to our customers of Umeå. Our vision is to provide a simpler everyday life for our customers and a sustainable future for all. We offer a 100% renewable electricity and 97-99% of District Heating and Cooling.

Our city network UmeNet is one of the world's fastest, and has made Umeå one of the world's most connected cities.

We are an ambitious organization with visions and goals in an industry in transition. Our biggest market is in Umeå, but we also have a large number of customers and partners in the rest of the country.

We have a turnover of SEK 1.6 billion, have over 350 employees and are certified within both environment and safety management.

Short CV of involved key researchers / staff

Jörgen Carlsson (Male)

Role in the project: Overall Project manager of Umeå energi AB/

Project leader Peak load variation management, Smart grid cooling and heating

Qualification: College degree in energy

Högskolan Eskilstuna/ Västerås (Mälardalens Högskola)

Staff category: Business developer

Short description of work experience, relevant to the proposal:

Previous coordination, City of Umeå, 2008-present:

- Project manager Umeå Energi, Sustainable Ålidhem, 2010-2014, awarded European Sustainable energy awards, 2013.
- Project management in numerous development projects around the business of district heating,- cooling, power production, photo voltaics systems and more.
- Well experienced in the climate and environmental aspects of energy consumption in modern society

Henrik Bristav (Male)

Role in the project: Participant/Project leader of Charging points for electric and hybrid vehicles Qualification: M.Sc. Biology, university of Umea, Sweden

Staff category: Environment Manager

Short description of work experience, relevant to the proposal:

- Management of climate and environment aspects of Umeå Energi businesses.
- Project management of numerous environment projects of the energy business, e.g. electric vehicles, charge points, emission- precipitation mitigation, permit management,
- Strategy expert in climate and environmental aspects of energy production and consumption in society

Bo Fredriksson (Male)

Role in the project: Participant/ Project leader Smart open data

Qualification: College degree

Staff category: Power grid and distribution

Short description of work experience, <u>relevant to the proposal</u>: Manager of several development projects around smart metering technologies

Curt Sjöstedt (Male)

Role in the project: Participant/ Project leader Photo Voltaics

Qualification: College degree in energy

Högskolan Eskilstuna/ Västerås (Mälardalens Högskola)

Staff category: Product specialist Photo Voltaic systems

Short description of work experience, relevant to the proposal:

- Market engineer and business hook-up of renewable energy production, such as wind farms and solar power.
- Customer and Partner negotiations and agreement expertise

Description of significant infrastructure and major items of technical equipment relevant to the project



Dåva 1: combined heat and power plant has for a long time been one of the leading plants of energy efficiency and low environmental impact. Dåva main fuel is waste. In this plant power and district heating is produced from heat recovery of municipal solid waste incineration. Inaugurated year 2000. The energy recovered in this plant can support 18,000 houses annual heating demand. Each and every year the plant is visited by guests from all over the world to learn more of the plant and our unique knowledge of the waste management business.



Dåva 2: combined heat and power plant our latest effort in meeting the increasing demand of environmentally sound energy supply. This plant uses biomass fuels, and produces power and heating to an equivalent of appr 40,000 houses



Wind farms. Our expertise lies in managing large scale wind farms. We have developed maintenance and services skills which we use in managing our wind farms.



Charge points for electric vehicles we have developed infrastructure solutions around charge point for electric and hybrid vehicles



Photo voltaic arrays. We deliver and project managed several large scale pv arrays in Umeå.

(UPAB)

Partner 23: Umeå Parkerings AB



www.upab.umea.se

UPAB is a municipally owned company, with approximately 25 employees. UPABs mission is to provide alternative mobility solutions and well-located and attractive parking facilities, enforce parking operations and parking control. We build and manage sustainable multi storage parking facilities. UPAB is responsible for visitors parking in the city centre, and help to create an attractive city center. We are constantly working to develop, innovate and improve urban space and its parking areas.

Short CV of involved key researchers / staff Linda Whyte (Female)

Role in the project: Coordination

Qualification: Master's degree in political science with environmental focus, Umeå University

Staff category: Head of Sustainability

Short description of work experience, <u>relevant to the proposal</u>: Project coordinator, Sustainable travel in Umeåregion 2009-2010, Project manager, Green Citizens of Europe – Life+ project 2010-2015. Head of Sustainability, UPAB 2015 -

Curt Jonsson (Male)

Role in the project: Coordination. Qualification: Technical & Business administration. Staff category: Head of Business development

Short description of work experience, <u>relevant to the proposal:</u> Project coordinator, Scanias development for customer designed 90 tons transport solution in the mining logistics in the north of Sweden. 2011-2014. Project manager, Constructions project for Scanias truck workshop in Luleå. Head of the service market for Scania in the north of Sweden

List of relevant previous projects or activities, connected to the subject of this proposal

Project name	Funded by	Budget involved for your organisation	Dates (start/end)
Greencit - Green citizens of Europe	Life plus	€0,3M	2010-2015

The overall objective of GREENCIT is to demonstrate how environmental policy can be interpreted and implemented into concrete citizen-oriented actions, which motivate and help citizens to change their behavior. Three specific settings have been selected: individual apartments in residential areas; jointly used waste management areas in residential blocks and the intra-city-region mobility system. Within these settings we will set up a number of actions, which aim to demonstrate methods and techniques that inspire and motivate people to change their behavior and become part of a process towards more sustainable city management policy and governance. The methods that will be used aim to optimize the combination of innovative technology and communication methods in an urban environment, and to demonstrate, test and evaluate how new technology and design together with new methods for communication can enhance environmentally friendly behavior in different settings: individual flats in residential blocks, waste management in residential blocks and the intra-city transport system. New techniques and methods which can help to monitor individual behavior and which at the same time also provides the individual with feedback that gives him/her motivation to act in a way that is of benefit for the environment, will be demonstrated.

Description of significant infrastructure and major items of technical equipment relevant to the project Not applicable

Not applicable

Partner 24: Transport Scotland

(TS)

www.transport.gov.scot



Transport Scotland was established in 2006 as the national transport agency for Scotland. We seek to deliver a safe, efficient, cost-effective and sustainable transport system for the benefit of the people of Scotland, playing a key role in helping to achieve the Scottish Government's Purpose of increasing sustainable economic growth with opportunities for all of Scotland to flourish.

Transport Scotland's delivery priorities, in the context of the government's purpose and this investment, are connecting Scotland and improving reliability and journey times in order to maximise opportunities for employment, business, leisure and tourism. We are also fully committed and currently progressing to a low carbon economy in the transport sector through low carbon technology and infrastructure, reducing emissions, tackling climate change and improving air quality. As an Agency of the Scottish Government, we are accountable to Parliament and the public through Scottish Ministers.

Short CV of involved key researchers / staff

Callum Donnelly (m): has worked for Transport Scotland since 2007 across a range of disciplines including Rail Planning and Strategy, Transport Resilience, and Electric Vehicle Charging Infrastructure. During this time he has gained experience in modelling, data analysis, stakeholder consultation and engagement, and ministerial and parliamentary briefings.

His current role has provided him with a firm understanding of the growing importance of electromobility in providing sustained improvements to transport and the environment more generally. A key aim of the Scottish Government is to all but eliminate vehicle emissions by 2050. This is a key focus of his current role, which has also provided him with experience across policy, strategy, project management, and procurement.

Relevant publications, and/or products, services or other achievements

- Transport Scotland's Response to Climate Change: Piloting of the Carbon Management System
- ROADS and CLIMATE CHANGE SEMINAR REPORT
- Switched On Scotland: A Roadmap to Widespread Adoption of Plug-in Vehicles.
- E-cosse partnership <u>http://www.e-cosse.net/</u>
- Advice on Low Carbon Vehicles
- Electric vehicle grants for motorists

The Scottish Government's vision is that that Scotland's towns, cities and communities will be free from the damaging effects of petrol and diesel vehicles by 2050. To support this the Scottish Government, in partnership with industry, academia, and environmental bodies, has developed Switched On Scotland: A Roadmap to Widespread Adoption of Plug-in Vehicles. The roadmap outlines our plan to drive forward the uptake of electric vehicles in Scotland and was published on 12 September 2013.

A key driver within the roadmap identifies supporting the growth of electric vehicle uptake. To achieve this the Scottish Government has provided funding to all Local Authorities and Community Planning Partnerships within Scotland for the installation of electric vehicle charge points, and in doing so has created the ChargePlace Scotland network. The network now offers over 600 publically available charge points and provides a network operator to support drivers and hosts. The network continues to grow to encourage further electric vehicle uptake.

E-cosse Partnership - The E-cosse partnership played a key role in the development of the Switched On Scotland report. Launched in March 2012, the partnership consists of the Scottish Government along with experts from industry, academia, environmental bodies and local authorities. The partnership continues to host regular forums and events attended by key figures to discuss various issues, developments, and strategies regarding the future of electro-mobility.

List of relevant previous projects or activities, connected to the subject of this proposal

Project acronym	Funding source/ period	Topic and website	Instrument
Hydrogen and fuel cell technology	Scottish Government	www.transport.gov.scot/environment/low -carbon-vehicles	Sector Support
Biofuels and other alternative fuels	Scottish Enterprise / Zero Waste Scotland	www.transport.gov.scot/environment/low -carbon-vehicles	Advice and Support
Charge Place Scotland*	Transport Scotland	www.energysavingtrust.org.uk/chargeplac e-scotland	Infrastructure
*ChargePlace Scotland is currently operated by Charge Your Car Ltd	Transport Scotland	www.chargeyourcar.org.uk	Infrastructure/ Operations

Partner 25: SP Power Systems Limited

(SPPS)

SCC-1-2016

www.spenergynetworks.co.uk



SP Power Systems Limited (SPPS) is part of the Scottish Power Group of companies which are part of the Iberdrola Group. Through our transmission and distribution network we provide power to: **1.5 million** customers in Merseyside, Cheshire, North Wales and North Shropshire; **2 million** customers in Central and Southern Scotland (including Glasgow).

SP Power Systems Limited has 30,000 substations (1 for every 100 customers), 40,000km overhead lines and 65,000km underground cables. They are a substantial employer with a distribution workforce of 2,600 internal employees made up of field staff, engineers, technical specialists, customer service and support staff based at 17 locations in the South of Scotland and 17 locations in England and Wales. Around 2,500 contractors across these areas are also used.

Electricity generated from power stations, wind farms and various other utilities are taken and transported through SP Power Systems Limitedvast transmission network. SP Power Systems Limitedhas a unique role in connecting renewable generation and bulk transfer of renewable energy from Scotland into England & Wales benefiting stakeholders well beyond their license area. Customers are also provided with new or upgraded connections to the network. SP Power Systems Limitedare one of the leading connection providers in the UK and have a wealth of experience in a wide range of projects, from one-off connections to large residential, retail and industrial developments, as well as sports stadia and leisure parks.

CVs of involved key researchers / staff members

Watson Peat is a Lead Engineer in the Future Networks team at SP Power Systems Limited (SPPS) and is currently taking a lead role on the 'Flexible Networks' project which has successfully developed techniques to release existing capacity on the network and defer traditional reinforcement.

Watson joined SPPS in 2007 as a Senior Project Manager responsible for a varied portfolio of projects on the electricity distribution network, ranging from LV rising mains in tower blocks to 33kV grid supply points. He is a chartered electrical engineer and previously held senior engineering and project management positions in other industries including 9 years in Water and 6 years in Rail.

Relevant publications, and/or products, services or other achievements

- Dynamic rating to support safe loading of distribution transformers CIRED 2015 Paper (Co-author)
- Real-time thermal rating reliability enhancement using a graceful degradation methodology CIRED 2015 Paper (Co-author)

Project acronym	Funding source/ period	Topic and website	Instrument
Smart Building Potential in Highly Utilised Networks	OFGEM Network Innovation Allowance / Technology Strategy Board funding 2014 - 2016	Demand side response in commercial buildings http://www.smarternetworks.org/Project.aspx? ProjectID=1678	Collaborative Project
Flexible Networks for a low Carbon Future	OFGEM Low Carbon Networks Fund Tier 2 2012 - 2015	Releasing additional capacity in electricity distribution networks to facilitate low carbon technology. <u>http://www.spenergynetworks.co.uk/pages/flex</u> <u>ible networks for a low carbon future.asp</u>	Collaborative Project

List of relevant previous projects or activities, connected to the subject of this proposal

Description of significant infrastructure and major items of technical equipment relevant to the project Scottish Power Energy Network's electrical network

(TCB)

Partner 26: Tennents Caledonian Brewery



www.tennentcaledonian.com

Tennent Caledonian Breweries UK Ltd is a brewery that was founded in 1740 and is one of Scotland's oldest ongoing businesses. It is now owned by <u>C&C Group plc</u>, which purchased the <u>subsidiary</u> in late August 2009 from <u>Belgian</u> brewing company <u>Anheuser-Busch InBev</u>. The company produces Tennent's Lager, which is the leading brand of pale lager in Scotland, and was first produced in 1885.

Tennent Caledonian Breweries' heritage, skill and passion for brewing allows them to create Scotland's best long alcoholic drink brands. Tennents are at the forefront of industry through continual investment in quality, but also by creating <u>enduring brands</u> that come to life through award-winning marketing and sponsorship programmes. There is a strong focus on innovation; and as such Tennents have ambitions to develop a Combined Heat and Power District Heating System for the brewery, with the intention of providing affordable local energy to nearby residents as well.

CVs of involved key researchers / staff members

Billy Mason (m) has worked in brewing business for most of his career **and** has been a fully qualified accountant since ha1984. He began his career with Scottish and Newcastle in 1976 and became a Financial Director first for the UK and then for Europe. He began in Business Development with the C&C Group in 2010 and have since become a Managing Director for Group Operations.

He enjoys the challenge of change management and likes to be involved in strategic projects for the C&C business, most recent with plans to develop a district heating unit at the Brewery. Member of the C&C Executive Management Committee; which is responsible for running the business and setting the business targets

Relevant publications, and/or products, services or other achievements District heating strategy

Description of significant infrastructure and major items of technical equipment relevant to the project

Brewery CHP generator and district heating

Partner 27: Siemens

(SIE)

www.siemens.co.uk

SIEMENS

Siemens plc was established in the United Kingdom over 170 years ago, with office and manufacturing operations throughout the country. Today, the company employs about 13,760 people. The company is active in more than 200 countries, focusing on the areas of electrification, automation and digitalisation. One of the world's largest producers of energy-efficient, resource-saving technologies, Siemens is No. 1 in offshore wind turbine construction, a leading supplier of combined cycle turbines for power generation, a leading provider of power transmission solutions and a pioneer in infrastructure solutions and automation and software solutions for industry. The company is also a leading supplier of medical imaging equipment – such as computed tomography and magnetic resonance imaging systems – and a leader in laboratory diagnostics as well as clinical IT. Siemens Plc are at the forefront of thought leadership in the areas of residential Demand Side Response, Vehicle to Grid Integration and Demand Response through public infrastructure.

CVs of involved key researchers / staff members

Mr Paul Brodrick, Head of Connected Communities – has 16+ years experience within the energy sector working for a number of key businesses whereby he has gained invaluable experience in developing new delivery and business models for emerging markets. Pauls previous achievements have seen him deliver significant leadership in advisory roles, including responsibility for technical design and commercial models for the Eco-island Project (Isle of Wight) and ESCO, and leading a successful bid for £1.5M LCNF Tier 2 Smart Grid Project providing communication services to UKPN. A recognised subject matter expert on delivery models for DCC, Paul is currently help shape market thinking and Siemens' key offerings for the emerging local community and municipal energy system market.

Mr Andrew Smyth, Project Manager – has 10+ years experience of engineering and management of complex projects. Since joining Siemens in 2012, Andrew has been responsible for the delivery of multiple 'demonstration' projects positioned at a Technology Readiness Level of between 4-7 for both our utility and local authority partners. Andrew has the skills and experience to work with and manage multiple stakeholders to drive delivery to programme and budget whilst reducing risk in delivery.

Mr Ivan Hewlett MIET, Senior Application Engineer – has 20+ years experience across both the energy and telecommunications sector. Previously a solutions developer and manager within a global telecommunications company, Ivan transferred to the energy sector in 2012 as a Senior Application Engineer within Siemens Smart Grid where he has been key in the development and delivery of innovative Microgrid solutions and integration and control technologies for renewable energy sources at both utility and domestic level.

Relevant publications, and/or products, services or other achievements

Siemens are at the forefront of shaping future energy market trends and the development of product and solutions which help our partners address the global challenge of providing increasingly robust, sustainable and affordable energy networks and services for the benefit of the consumer.

Project acronym	Funding source/ period	Topic and website	Instrument
Smart Building Potential	TSB / Innovate UK – Smart City Project 2013 Low Carbon Network Fund, Tier 1 - 2014	Project exploring the benefits of 'Smart' Buildings providing demand flexibility to heavily utilised city centres. Siemens have delivered the full Smart building enablement and DSR solution currently hosted at Siemens' premises.	TSB / Innovate UK – Smart City Project Ofgem LCNF Tier 1 – SPT1006
Triangulum	European Commission – SCC Strategic Implementation Plan	Project demonstrating how a systems innovation approach can drive dynamic smart city development. Siemens are lead partner for 1 of the 3 lighthouse cities (Manchester, Eindhoven and Stavanger) transforming the Manchester Oxford Road corridor into a 'smart quarter'.	H2020, SCC-01- 2014
SoLa BRISTOL	Low Carbon Network Fund, Tier 2 - 2011	Project exploring and demonstrating the shared use of battery storage and inverter technology within residential and communal buildings to the benefit of both the distribution network operator (constraint management) and consumer (variable FIT). As the project technology partner, Siemens delivered the battery storage technology into the properties and the overarching control solution for constraint management.	Ofgem LCNF Tier 2 - WPDT2003

List of relevant previous projects or activities, connected to the subject of this proposal

Description of significant infrastructure and major items of technical equipment relevant to the project

As part of the Smart Building Potential project, Siemens have delivered and currently host the Demand-Side Management Controller solution for Glasgow City Council and Scottish Power Energy Networks, which provides the controlling interface into 'smart' enabled buildings for achieving demand response and flexibility for network constraint management.

Partner 28: Pomeranian Interdisciplinary ICT > DICTEC > Excellence Center (PICTEC)

www.pictec.eu

Participant profile

PICTEC (Pomeranian Interdisciplinary ICT Excellence Centre) is a research and technology organization (based in Gdansk, Poland) established in 2015 in the form of a non-profit foundation under the auspices and with the support of several key actors in regional innovation system in Pomerania region, including the city of Gdansk, Sopot, and Gdynia (so-called Tricity Agglomeration), Gdansk Metropolitan Area Association, Pomeranian Special Economic Zone, Marshal's Office of Pomeranian Voivodeship, Gdansk Science and Technology Park, Pomeranian Development Agency, and Gdansk University of Technology. The mission of PICTEC is to conduct research and development activities in the field of applied science and to transfer the results to public administration, industry, and society at large. PICTEC is appointed to address substantial challenges of regional economic and societal life in three fundamental themes of research and innovation actions covering smart city, smart port, and smart living.

In accordance with its mission and area of expertise, PICTEC will contribute to the work on smart solutions replication plans that will be carried out in WP7. PICTEC will support Gdansk in requirements definition and the outline of the architecture of integrated cross-domain ICT solutions in the area of energy and mobility. Further, PICTEC shall also engage in Gdansk "smart city governing group" and act as an interface between the consortium and local ICT ecosystem. This will be possible due to close cooperation with Pomeranian ICT cluster INTERIZON that associates more than 150 entities from ICT industry with more than 25k overall employment. PICTEC will offer its expertise in ICT solutions design and development, especially in the area of open-data standards.

Extensive and diversified transdisciplinary competences in the area of ICT, software engineering, stakeholders relations, and innovation management offered by PICTEC key personnel guarantee suitable approach to address project challenges and to deliver required output.

CVs of involved key researchers / staff members

Dr. Mateusz Bonecki (male) holds PhD from Adam Mickiewicz University in Poland in the field of methodology. He studied at AMU and at the University of Siegen (Germany). He visited the University of Konstanz as postdoctoral fellow. Since 2010 Mateusz is an assistant professor at the AMU where he teaches - inter alia theory of knowledge, intelligent organizational systems, and knowledge management. In 2010 became a member of International Institute of Business Analysis. In 2012 he coordinated research and authored concluding expertise "Best practices and principles for cooperation within the Pomeranian ICT Cluster" prepared for the Gdansk University of Technology (GUT) that at the time administrated the Pomeranian ICT Cluster INTERIZON. As consultant working for Pomeranian Group for Competence in Business Clusters in 2012, he led trainings on rules for cooperation and knowledge exchange in clustering initiatives for the representatives of all major business clusters in Pomerania region. In 2013 he participated in SINTELNET Warsaw Group (FP7: European Network for Social Intelligence) and conducted research in theory of belief systems and cognitive presuppositions. Mateusz published a number of works in the field science methodology, organizational culture, epistemology, and theory of knowledge. His recent scientific interests, publications, and conference papers focus on knowledge and innovation management, design science, and systems theory. Since 2013 he is with BetterSolutions - an ICT company based in Pomerania region where he acts as Director of Research and Development, being responsible for R&D activities, innovation management, and coordination of business analysis. As a business analyst and project manager he was involved in several software development projects in domain of urban management, transport and mobility, e-commerce, and e-health. In particular, Mateusz has participated in ACCUS (Adaptive Cooperative Control in Urban Subsystems) project (ARTEMIS, 2013-2016) that seeks to create an open source smart city platform based on system of systems approach. His task is to coordinate R&D work as well as knowledge exchange between the company, consortium, local academia, and end-users of community and local government. From 2014 he is involved – as a co-leader – in ICT Cluster INTERIZON task group that seeks to facilitate an innovation and business friendly environment for the technological output of ACCUS. On this occasion he consulted public administration during several meetings and conferences. He was invited by Union of Baltic Cities and Citizens For Safety initiative (Flagship Project S-37 Building Urban Safety through Citizens Participation) to consult application of ICT solutions in order to improve urban safety within Baltic Sea Region.

Dr. Stanisław Raczyński (male) received his Master of Science degree from Gdańsk University of Technology, Faculty of Electronics, Telecommunications and Informatics (Poland) in 2006, majoring in System Control and Robotics. He then receive the prestigious Japanese Government Scholarship and became a research student at the University of Tokyo, Graduate School of Information Science and Technology (Japan), and then a doctoral student at the same graduate school in 2007. After defending his doctoral thesis on statistical methods in multiple pitch estimation in musical signals in 2010, he was an assistant professor at the same graduate school before starting his postdoctoral fellowship at Inria in Rennes (France) in 2011. In 2013, he returned to his alma mater as part of the Homing Plus programme of the Foundation for Polish Science to take a position of an adjunct professor, where he teaches robotics and performs research. His main research interests include acoustic source localization, musical information retrieval, language modeling and robot audition. He is an author of 28 papers and his current h-index is 8.

Dr. hab. Anna Malitowska (female) studied in Poznan (Poland) and Hannover (Germany). She conducted her doctoral studies at the University of Granada (Spain) and Adam Mickiewicz University (Poland) where she received her doctorate in ethics in 2004. Anna was also a visiting scholar at University of Siegen in Germany lecturing and performing research in ethics and theory of agency and at the University of Konstanz. She has published numerous scientific papers and two books (2009 and 2014) covering topics of ethics, action theory, corporate social responsibility (CSR), learning environments, education, and theory of professional services. As an expert in applied and business ethics in 2008 and 2009 she has worked for Polish financial auditing agency – The National Chamber of Statutory Auditors (KIBR) in order to provide training and expertise in standards of conduct and internal regulations. In 2012 she participated in research project and co-authored the report for Pomeranian ICT Cluster titled "Best practices and principles for cooperation within the Pomeranian ICT Cluster" prepared on the request of Gdansk University of Technology (GUT) to support INTERIZON cluster management board. In 2013 Anna took part in social-innovation project "BRIng: Social Sciences for the Economy" funded by National Centre for Research and Development (NCBiR). Since 2010 as freelance advisor Anna cooperates closely with GGC, a top Polish consulting company based in Warsaw. During that time she has worked as media relations representative and cooperated with major Polish TV broadcasters and press publishers. Offering expertise in CSR, business ethics, organizational design, and public relations Anna has participated in numerous projects for clients in wide range of industries. She was appointed as a key executive in project carried out for global consulting company Alvarez & Marsal where she was responsible for communication strategy for introducing A&M consulting solutions in area of cyber-security.

Dr. hab. Mariusz Czepczyński (male) is cultural geographer, professor at the Department of Spatial Management, University of Gdańsk, Poland. His research interests are focused on cultural landscapes, postsocialist cities, heritages, urban cultures, critical geographies, quality of life, and local and regional development. He studies at the University of Gdańsk, and the University of Warsaw. Additionally, attended courses at the University of Oslo (1997) and Harvard School of Design (1993). In 2009 – 2011 he had been employed as a visiting professor at the Geographical Institute of the Eberhard Karls Universität Tübingen, Germany. His activities also include consultancy and advisory, recently to Administration of Gdańsk Province (Pomorskie), Kartuzy county, Gdańsk Metropolitan Area Association, Polish Metropolitan Union, City Hall of Lodz and Thuringian Ministry for Economy, Labour and Technology. Prof. Czepczyński is also a senior advisor of the Mayor of Gdańsk, and moderated the process of City of Gdańsk strategic planning in 2015, as well as an expert on smart cities, open data and public participation. He was deputy coordinator at the RECOURSE Research and Education Centre for Urban Socio-Economic Development – Centre of Excellency within the 5th Framework Programme. His is an author of more than 80 scientific publications, including Cultural Landscape of Post-Socialist Cities. Representation of Powers and Needs (Ashgate: 2008), The City during the Times of Transformation: Experiencing 20 Years of Self-Governance in Gdansk (ed. 2011, in Polish), Spaces of the post-socialist cities. Social transformations of urban areas (ed. 2006, in Polish), Featuring the Quality of Urban Life in Contemporary Cities of Eastern and Western Europe (eds. with I. Sagan, 2004). He was a member of Investigating Cultural Sustainability COST Action Programme and the Metropolitan Working Group of the Polish Academy of Sciences.

Szymon Bohdanowicz MSc (male) graduated from University of Gdańsk, in the field of Artificial Intelligence, and from University of Southern Denmark, where he received his bachelor's degree in the field of economy and information technology, within the framework of an international bachelor's program. He is a senior developer with extensive professional experience in the information technology sector. He started his professional career in 2007 by cooperating with the Information Technology Agency, a company based in Gdańsk and creating, among other things, auditing and controlling software. He also conducted IT trainings for the employees of the Zeto company. In cooperation with the Kornet company he designed and programmed an application to support information exchange in public administration. He also cooperated with the Polish-Japanese Institute of Information Technology on the creation of a boat simulator for the Ministry of National Defence. He took part in projects financed by the European Union, within the framework of which he provided IT courses and trainings. He has been also involved in ACCUS (Adaptive Cooperative Control in Urban (sub)Systems; ARTEMIS, 2013-2016) project, where he was responsible for complex event processing engine for system of systems architecture applied to integrate urban subsystems and processes and ICP platform design and development. His main areas of activity have been: OLAP and data warehouses, business process management, and rules management systems. During his professional career he has been an active member of the JBoss, Spring, and Vaadin software communities: He is an advanced user of Java, the Spring framework, Java EE, and Hibernate.

Relevant publications, and/or products, services or other achievements

PICTEC activities cover a wide range of applied research, technology assessment, intra- and extramural R&D projects, and consulting services.

PICTEC has conducted R&D&I advisory process for **Gdansk Tourist Organization (GOT)** in the field of ICT applications for acquisition, processing and reporting of statistical data on local tourism. During the project PICTEC has collected requirements for the solution and provided general technical specification.

In 2014-2015 PICTEC has worked for **SESCOM SA** (provider of HVAC, building automation, and building energy management systems) and conducted R&D&I advisory process in the field of electrolytic hydrogen generator, which had been a result of internal research and development activities conducted by the company. The project included analysis of the state of the art in hydrogen generation technology, analysis of the results of prototyping made by the company, analysis of current directions of research carried out worldwide, analysis of resources available in the regional innovation ecosystem and potential sources of funding.

PICTEC has also played important role in the process of defining **Smart Regional Specialization (S3)** of Pomerania region by co-authoring (together with Gdansk University of Technology) the project "PortOS - Port Operating System. Development of integration platform for harbour ICT systems" that was positively evaluated by experts from Polish national R&D funding agency: National Centre for Research and Development (NCBiR). The project is considered as one of the flagship initiatives of "ISP2 - Interactive technologies in information-intensive environments" regional specialization that was defined to stimulate regional supply of technologies for smart environments, including smart city, smart harbor, and smart factory.

Project acronym	Funding source/ period	Topic of the project / activities	Relevance and link to AEM
ACCUS	ARTEMIS-JU 2012	"Adaptive Cooperative Control in Urban (sub) Systems" - development of open-source platform to integrate and coordinate processes of distributed urban subsystems.	ACCUS ICP platform is dedicated to integrate cyber- physical systems and IoT solutions in domains like energy and urban transportation.
	NCBR (PL)	"Hybrid source of electric power for devices supporting rescue actions	Expertise on EV technologies used in defence sector.

List of relevant previous projects or activities, connected to the subject of this proposal PICTEC team has gained experience, *inter alia*, in the following projects:
		and emergency evacuation"	
ROSeS	H2020 SCC-03-2015	"Resource Orientation for Smart City Standardization" lead by TNO. PICTEC was responsible for the demonstration of interoperability solutions for smart city environments.	The goal of the project was to develop standards for vertical interoperability of urban systems and composition of cross-domain functionalities using heterogeneous resources. The project was evaluated positively (12.50/15.00; above threshold) but did not receive funding due to limited call budget allocation.

Description of significant infrastructure and major items of technical equipment relevant to the project

PICTEC possesses all the necessary equipment to carry out assigned activities, including laptops and software required for systems architecture design and requirements processing as well as project outcome reporting, document editing, and communication.

Large Infra structure Not applicable.

Partner 29: UNIRESEARCH

(UNR)

www.uniresearch.nl



Uniresearch B.V. (UNR) is a SME (founded in 1994) which is specialised in supplying project management and consultancy services in the field of national and European research projects and innovation activities. Uniresearch is and has been involved in many research projects. For example in the field of automotive safety such as ASSESS, COVER, THORAX and AsPeCSS, in the field of the electrification of road transport such as FUEREX, OPTIMORE, ASTERICS, in the field of urban mobility (CityMobil, CIVITAS). Next to this, Uniresearch is involved in the field of security (SECTRONIC), in the maritime domain (NAVTRONIC), and sustainable energy (CO₂ capture (CESAR), Solar cell developments (SE-PowerFoil, Fasttrack, SuMMiT). More examples of EU research projects managed by Uniresearch can be found at <u>www.uniresearch.nl</u>.

In the RUGGEDISED project, Uniresearch has been assigned the task of project management.

Uniresearch has a team of qualified consultants, bringing together a mix of technical, scientific and business administration backgrounds. Based on the management experience gained in over 120 R&D projects, a web based project management and transparent communication tool has been developed that provides a central archive of all project related files, an online reporting function, up-to-date performance and progress overviews (both technical and financial), a shared webserver that enables the uploading/sorting of project files by all partners, a platform for (technical) discussions, and a public domain for dissemination purposes (window to the outside).

Short CV of involved key researchers / staff

Mrs Kathrin Braun (MA). Kathrin has a Master of Arts degree (MA) in European Studies. Kathrin, who has lived and worked in six European countries, has 10 years' work experience in European grant schemes (in particular FP7 Energy/Intelligent Energy for Europe) as well as in project management. Next to that she has experience in organising events and conferences. Until April 2014 Kathrin was the Energy National Contact Point for Horizon 2020 in The Netherlands. She has also worked for the built environment department of Ecofys as a project manager and for the European Renewable Energy Council in Brussels. She currently focusses on several grant applications for a number of clients.

Mr. Cor van der Zweep (M.Sc.). Cor has a Master degree in Mechanical Engineering (Technical University of Twente). He is responsible as senior project manager for the project management and administration of research and innovation projects, among them several EU funded project (FP6 and FP7). Since 2006 employed at Uniresearch as senior project manager. Formally employed (2000 to 2006), at TNO Automotive, responsible as researcher and project manager for several (inter)national automotive research projects in the area of active and passive safety. Project responsibility: day-to-day project management, dissemination activities and exploitation plans.

Mrs. Jacqueline Heintz. After her study, Jacqueline worked for a number of years in the retail (own shop). Later on she worked as management assistant for International companies like Fugro (engineering) and Shell (oil company). She joined Uniresearch in December 2007. Jacqueline will be involved in the administration of the project

List of relevant previous projects	or activities,	connected to the	subject of this propos	al

Project acronym	Funding source/ period	Topic and website	Instrument
TRANSFORMERS	FP7-Green Vehicles 2013-2017	Configurable and Adaptable Trucks and Trailers for Optimal Transport Efficiency <u>http://www.transformers-project.eu/</u>	Large-scale integrated project
RESIN	H2020-DRS 2015-2018	Climate Resilient Cities and Infrastructures http://www.resin-cities.eu/home/	Research and Innovation Action
ECOCHAMPS	H2020-GV 2015-2018	European COmpetitiveness in Commercial Hybrid and AutoMotive PowertrainS <u>http://www.ecochamps.eu/</u>	Innovation Action
CIVITAS – WIKI	FP7 – Civitas Plus II 2012 - 2016	Coordination, dissemination and evaluation of Civitas plus II <u>http://www.civitas.eu/</u>	Coordination and support action
Smart-Rail	H2020 2015 - 2018	Smart Supply Chain Oriented Rail Freight Services http://www.smartrail-project.eu/	Research and Innovation action
HPEM2GAS	FCH JU 2016 - 2019	High Performance PEM Electrolyzer for Cost- effective Grid Balancing Applications (website available soon)	Research and Innovation action

Large Infra structure Not applicable

Partner 30: Infomobility

(INF) www.infomobility.pr.it



Infomobility S.p.A. is a joint stock company founded in December 2001 and owned by the Municipality of Parma. Its core mission is to provide services and manage infrastructure for sustainable mobility in an integrated and innovative way. Its core activities are: bike and car sharing, bike renting; control of the restricted traffic zones, monitoring of the vehicle traffic in restricted traffic zones; management of the bike park by the railway station; communication and marketing to increase walking and cycling shares.

Infomobility will support the Municipality of Parma in the implementation of the replication and investment plan especially in the area of mobility. In particular, Infomobility will be in charge of the communication and dissemination actions both locally and nationally; will work actively in setting up and running the smart city governing group; will organize the local governance workshops; will participate in the workshops, tours and meetings as necessary; will work actively with the Municipality and the others partners for the replication of e-vehicles charging infrastructures and the development of electric mobility, bike/car sharing mobility and modal split in the urban area.

Two divisions will work in the project: The Marketing and European Project Office is run by three people, it supports the development of sustainable and innovative mobility in Parma thorough two actions: the development of European projects and the marketing and communication activities for bike and car sharing, electric mobility. The Sustainable mobility office is run by eight people, it manages the services of bike and car sharing, including some e-vehicles; bike renting; the Velostazione the bike parking for commuters and visitors; the integrated system for access control system of vehicles in the city centre; the recording of vehicle flows in restricted traffic zones; the parking areas including permits and ticketing.

CVs of involved key researchers / staff members

Chiara Spaggiari (MA) – Head of Marketing and European Projects Division of Infomobility since 2010. She has a degree in Law at the University of Parma in 1998 and the Master Degree in Business Communication and Marketing at Ca' Foscari University in Venice in 2001. She worked for several years as project manager in advertising agency and media company, where she developed experience in marketing and communication management and a deep knowledge of marketing issues. She has been working in Infomobility S.p.A. since 2005, in the Sustainable Mobility Marketing and Communication department, planning and developing communication and marketing strategy and activities.

Eugenia Capone (MA) - She has a degree in European Languages and Literatures from the University of Parma and a Master in European Public Relations. She is journalist, interpreter and project manager. She has lived and worked in Argentina, Italy and France. During her career she worked for Parma Exhibition centre as interpreter, for the Chamber of Commerce in Buenos Aires to develop Italian-Argentine commercial projects, in Magneti Marelli Argentina S.A. with Italian and foreign delegations; in the Press Office of Ducati Motor S.p.A., in the editorial offices in Parma and in Paris of Buongiorno S.p.a. From 2005 she works in Infomobility S.p.A., in Marketing and European Projects Division, as responsible of the Press Office and project manager in European projects.

Sara Ombellini - She graduated in Philosophy at University of Bologna and then gained experience in communication by working in an advertising and communication agency and in a press office; she also worked as a freelancer for the culture page of the local newspaper "Gazzetta di Parma". Since 2007 she works in Infomobility, in Marketing and European Projects.

Relevant publications, and/or products, services or other achievements

"CARMA project - Showcase Implementation Report Activities on the cities", April 2013

- http://www.cyclingcarma.com/D5.4%20Showcase%20implementation.pdf

Services:

- Sustainable urban mobility: car sharing (including some electric cars); bike sharing; bike renting; bike parking by the railway station.
- Electronic ticketing "Easypark" for paying the parking fees by phone, tablet or PC.
- Technological application for the mobility of elderly and disabled people in cities and towns: use of parking areas, access permissions to restricted traffic areas and for the use of local public transport (being in the final development phase by a FP7 project)

List of relevant previous projects or activities, connected to the subject of this proposal

Project acronym	Funding source/ period	Topic and website	Instrument / relevance
CARMA - Cycling Awareness Raising and Marketing	Funded by IEE - Intelligent Energy Europe. 2010-2013.	Cycling Awareness Raising and Marketing; develop new methods to increase cycling in urban areas. <u>http://www.cyclingcarma.com</u>	Ruggedised project will build upon the experience gained and the best practices developed in CARMA
ECOSTARS	Funded by IEE - Intelligent Energy Europe (STEER). 2011-2014.	More efficient and cleaner freight and passenger transport vehicle movements by providing recognition, guidance and advice to operators of vehicle fleets. <u>http://www.ecostars- europe.eu/en/</u>	Contribute to the air quality strategy of Parma and to the integrated strategy on urban freight that Parma is developing.
SIMON - Sustainable MObility for older and impared people	Framework Programme 7 / 2013-2016	Technological applications for the mobility of elderly and disabled people in the urban area, the use of local public transport and access permissions to areas restricted to traffic. http://simon-project.eu/	Contributes to the strategy of Parma as inclusive and sustainable city. The results may be integrated in the replication plan.
CIVINET - CIVITAS	Smart city, smart mobility 2012 - 2020 Founded by EU	Italian network of public bodies, associations, companies, research centers and universities from the CIVITAS initiative.	Ruggedised will build upon the knowledge exchange, capacity building and best practices on sustainable and smart mobility gained from the network.

Large Infra structure

	Cost (€)	Justification
Large research infrastructure		Not applicable

Partner 32: Future Insight

(FI)

www.futureinsight.nl



Future Insight Group B.V. (FI), founded in 2014, is an innovative SME which combines high tech IT, engineering and psychology to support large scale projects in executing their work more efficiently. With the use of our own developed Clearly-method and supporting software we are able to create more insight for all stakeholders involved and let them work more efficiently in general processes. Our Clearly-method and dashboard are in use with several large scale civil projects, like the construction of a 40 km national road (N23) and the development of a city wide 3D information model for the city of Rotterdam.

With our unique combination of engineers, IT developers and organizational psychologists in our team we create synergy in knowledge, competencies and our way of working. Together we cover a wide range of expertise in IT, local government, the field of construction and change management, offering an open integral approach and solution for the challenges of tomorrow.

CVs of involved key researchers / staff members

Mr. Rick Klooster (B.Sc.) Rick Klooster is as a managing partner responsible for technical matters within FI. Through his experience in the field of data management and the wide application of this within the geo-world knows how to quickly analyze problems and create sustainable solutions. Before Rick started FI, he worked for 15 years at the municipality of Apeldoorn, where he served as project manager and was responsible for Data Management for the entire municipality. During that time he has done many projects in both 2D and 3D area. In addition, Rick was closely involved in several 3D projects in the Netherlands, including the 3D Pilot.

Mr. Bas Hoorn (B.Sc). Bas Hoorn is as managing partner in FI responsible for the general affairs. Bas has over 10 years experience within multidisciplinary (infrastructural) projects, and knows what it takes to create a successful project. Bass is always thinking from the big picture and therefore sees the possibilities of making connections between different disciplines within (project) organizations quickly. Before Bas started FI he worked for 5 years at Unihorn Engineering and most recently as project manager at Antea Group.

Mrs. Judith van Deth-Dijkhuis (M.Sc.). Judith has a Master degree in Organizational Psychology (University of Utrecht). As Manager Organizational Design & Development she is responsible for the 'soft side' of our service. Formally employed as Training Manager in the Hospitality Industry and as Trainer/advisor at a top 5 training company she has seen a wide variety of situations where support in organizational change and development was needed. Connecting different worlds is her expertise. Project responsibility: project support and organization, consultancy and facilitator activities.

Project acronym	Funding source/period	Topic of the project / activities	Relevance and link
Rotterdam 3D V2.0	2014-2015	Open 3D CLEARLY Dashboard: Took the first steps of implementing our Open 3D Dashboard at the City of Rotterdam.	Similar methods and techniques
Reorganize N23	2013-2015	Redesigned, organised and automated 13 primary working processes for a large road construction project using our CLEARLY dashboard and CLEARLY approach.	Similar methods and techniques

List of relevant previous projects or activities, connected to the subject of this proposal

3D Pilot 2010-2013	Team lead within the Dutch national 3D pilot for the working group use cases, which developed the 3D standard for the Netherlands.	Similar methods and techniques
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Description of significant infrastructure and major items of technical equipment relevant to the project

Future Insight's 3D CLEARLY Dashboard will be used to setup the planned open 3D infrastructure.

Partner 32: the Wheatley Group



(WG) http://www.wheatley-group.com/

SCC-1-2016

The Wheatley Group is the largest registered social landlord, health care and property management group in Scotland. We provide services to over 200,000 people across 12 local authorities in Scotland and manage over 70,000 properties.

In the work package looking at the business case for connecting the Tennents CHP to Drygate, we will have a direct input into the business case, as well as providing information on the housing, performance characteristic, tenure, etc – and also give expertise input from capital infrastructure knowledge and advice on matters such as energy provision to tenants.

For the work package looking at Domestic demand-side management, we will identify properties within Drygate to install DSM equipment, to assist in the monitoring of demand-side events in the properties and the effect they are having on residents and to contribute to the development of a business case for the further deployment of domestic DSM across the city. The latter will be coordinated by GCC/Siemens.

We own and operate district heating connected to over 3,400 properties across Glasgow and central Scotland. We have a significant experience with capital and cyclical investment with over £1.3 billion spent in the last 10 year on building performance improvements such as external wall insulation to over 36,000 properties, district heating connection of 2,800 dwellings, gas infrastructure connection to 12,000 homes, as well as an array of internal property upgrades such as electrical re-wiring, re-plumbing and re-roofing, etc. We own and operate over 650 solar PV installations, biomass district heating, ground source heat pumps, combined heat and power stations and a range of low-carbon technologies.

CVs of involved key researchers / staff members

Colin Reid (M)

As the representative for one of the UK's largest housing and care providers, I have been lucky enough to be part of the foundation board and development executive of the only 'not-for-profit' energy supplier currently operating in the UK. My duties have included assistance with the business plan development iterations, organisational membership expansion and building investor relations. The culmination of this collective work saw Our Power Energy Supply Ltd launched by the Scottish Minister for Social Justice. Our Power membership has a customer base of over 200,000 households and development finance through the Scottish Government and Social Investment Scotland; with the objective to bring affordable energy as a mitigation of Fuel Poverty in Scotland.

Relevant publications, and/or products, services or other achievements

Glasgow Housing Association: winner of the EFQM good practise competition 2013 – new ways of working, <u>read more</u>

Description of significant infrastructure and major items of technical equipment relevant to the project

We will be connecting to a new combined heat and power energy centre within the boundary of Tennent's Brewery. In order to connected this new facility with the Drygate properties we will be constructing a heat mains under John Knox Street in Glasgow, working around existing underground utilities.

Once within the boundary of the Drygate development we will install distribution heat mains throughout the estate, with associated riser and lateral network within the connected blocks. At each dwelling we will install heat interface units (HIU) with applicable metering and internal heat circuit connections. We will be replacing electric showers, electric storage heaters and electric hot water cylinder with the new HIU and wet radiator system, as well as thermostatic mixing showers.

Large Infra structure Not applicable

Partner 33: Gdansk Water Utilities Ltd

(GIWK) www.giwk.pl



Participant profile

Gdansk Water Utilities Ltd was established on 24 June 2004 by the city of Gdansk, as a commercial legal company to improve the economic effectiveness of management of the water supply and sewage disposal systems. GIWK is the owner of water supply and wastewater collection system in Gdansk.

The main task of GIWK: developing investments for the improvement of the quality of drinking water and wastewater discharged to the environment, increasing the capacity of sewerage system and improving environmental protection, planning the development of the water supply and wastewater collection systems in Gdansk, commissioning and improvement of water and wastewater treatment processes, energy production from biogas at the wastewater treatment plant Gdansk – Wschod, taking plipcare of water intakes protection zones and drinking water resources, ecological education for the inhabitants of Gdansk.

Gdansk Water Utilities Ltd is also an active member of Regional Pomeranian Chamber of Commerce, Chamber of Commerce 'Polish Water Supply System' (the organization joining together most companies dealing with water supply and wastewater collection) and Gdansk Metropolitan Area.

Major effort of Gdansk Water Utilities Ltd is allocated in WP7. GIWK is a key partner to Gdansk municipality in several replication projects and to that end it will take part in networking and knowledge transfer activities (T7.1) and in the workshops and meetings of smart city governing group (T7.2). GIWK expertise will be also used during the participatory foresight process (T7.3) and during the drafting of replication plans (T7.4).

Gdansk Water Utilities Ltd employs about 120 people, has in its structures substantive departments, which prepare and perform strategic investment projects water supply and sewage system in Gdansk. Moreover, GIWK is involved in research projects in field of the optimisation of wastewater treatment processes and energy efficiency effectiveness of a wastewater treatment plant.

In the framework of project preparation GIWK will work in the scope of:

- 1. Complex monitoring of quality and quantity of underground water intakes. An intelligent control system for monitoring pollutants in the urban areas to efficiently regulated and controlled.
- 2. The smart energy management using waste water as an energy source with the potential to heat public and administration buildings, schools, sport facilities. It will be developed and tested to improve constructing a renewable and economically viable energy source for our city.
- 3. Monitoring and governing platform creating a platform that will collect data related to city management (water supply and wastewater collection system).
- 4. The concept of using wastewater collection system to keep cables telecommunication.

CVs of involved key researchers / staff members

Ryszard Gajewski (male) – he graduated from Gdansk University of Technology. Technical Director of GIWK. He is certified engineer, Master of Business Administration. He specializes in all technical matters in the company and serves as oversight of its investments, involved in Gdansk Water and Sewage Project. Expert in municipal water/wastewater systems.

Many years' experience in management of both investment and soft projects.

Jacek Kaszubowski (male) – he graduated from Gdansk University of Technology. Many years' experience and expertise on water supply and waste water collection systems, co-author of the plan of development Gdansk water supply system in the years 2010-2025, co-author of the concept plans and investments in Gdansk system of water supply and sewerage, many years' experience in the operation and management system Gdansk water production and distribution.

Karolina Plichta (female) – she graduated from Gdansk University of Technology. Since 2007 she has worked for Gdansk Water and Sewage Infrastructure Ltd as Technical Specialist. She is certified engineer. She participated in the preparation projects of water supply and sewage system investments.

	ist of relevant previous projects of activities, connected to the subject of this proposal			
Project acronym	Funding source/ period	Topic of the project / activities		
GPWS	CF / 2004-2006	Gdansk Water and Waste Water Project http://www.giwk.pl/inwestycje/gdanski-projekt-wodnosciekowy- 1.html		
GPWS2	CF / 2007-2013	Gdansk Water and Waste Water Project – phase 2 http://www.giwk.pl/inwestycje/gdanski-projekt-wodnosciekowy- 2.html		
СНР	ERDF / 2007-2013	Biogas energetic recovery at Gdansk East Sewage Treatment Plant http://www.giwk.pl/ekologia/OZE/CHP.html		
NonHazCity	Interreg Baltic Sea Region 2016-2018	Innovative management solutions for minimalizing emissions of hazardous substances from urban areas in the Baltic Sea Region.		
IWAMA	Interreg Baltic Sea Region 2016-2018	Interactive Water Management.		

List of relevant previous projects or activities, connected to the subject of this proposal

Description of significant infrastructure and major items of technical equipment relevant to the project Not applicable

Large Infra structure Not applicable

Partner 34: Swedish ICT

(SI)

www.swedishict.se



Participant profile

Swedish ICT is a group of world-leading research institutes within Information and Communication technologies (ICT), enabling sustainable growth and the digitalization of industry and society. In close collaboration with industry, public sector and academia we turn research results into innovations that contribute to greater competitiveness, renewal, and better quality of life. We offer both specific expertise and cross-border solutions based on ICT; from sensors and sensor systems, network technologies and big data analysis and cloud services to visualization, interaction design and sustainable business models. Swedish ICT is a neutral, non-profit-distributing, organization owned by the state. The group comprises of Acreo Swedish ICT, SICS Swedish ICT, Interactive Institute Swedish ICT and Viktoria Swedish ICT. Swedish ICT is part of RISE, Research Institutes of Sweden.

The main task of Swedish ICT will be to identify, develop and help applying new business models in an environment where data from a large amount of sources are shared and used by several service providers. In order to assure "openness" in the sense that any authorized service provider can gain access to any data point there have to be mechanisms for access control and security/integrity that should be handled by a new type of actor – this is in principle similar to all IoT applications that enforce openness. If the data collection is financed by public sources the organization responsible for the procurement must understand such business mechanisms in order to set the right requirements, and part of the task will be to assist and educate these organizations.

CVs of involved key researchers / staff members

Claus Popp Larsen (Male)

Role in the project: Business models for shared service platforms

Qualification: PhD

Short description of work experience, relevant to the proposal:

Claus is leading the smart city activities at Swedish ICT which includes infrastructure, business models, governance and new innovative services in a digital, connected world. He particularly focuses on the collaboration between technology suppliers, service providers and public organisations in order to establish open and shared platforms for digital services for the citizens. He has more than 15 years of experience in the area and has coordinated several national and international projects.

Project acronym	Funding source/ period	Topic and website
Smart Home	Vinnova, 2015-2016	The project brings together 25 partners, including municipalities, housing associations and small and large businesses in order to create an open platform for services, as well as common business models. The project focuses on digital services within facility management, energy and social care. https://www.acreo.se/projects/smarta-hem
SURE!	Nordic Built, 2014-2017	Large numbers of multi-tennant units from the 60s and 70s are being renovated. Higher overall energy efficiency is required. The project aims to Improve energy efficiency through a combination of new ways of controlling energy flows in a building with increased user awareness through visualisation. https://www.tii.se/projects/sure-nordic-built-for-sustainable-retrofitting
Celsius	FP7, 2013-2017	The main objective is to use primary and secondary energy flows within a city in order to increase the energy efficiency. By integrating effective systems for heat and cold, the use of primary energy sources will be maximized and enable the use of overflow heat supplies. http://celsiuscity.eu
Urban ICT Arena	Various sources including City of Stockholm, 2016- 2018	Large scale testbed using new and emerging infrastructures such as 5G, meshed low power wide-area networks and public WiFi connected over optical fibre with access points in lamp posts and bus stops. Examples of tests: Ericssons emerging 5G, environmental sensors in the city and open data, driverless trucks, new business models. http://kista.com/about/kista-interacts/urban-ict-arena
Indoor Mobile Coverage	Vinnova, 2015-2016	High requirements on energy efficient buildings has resulted in wider walls and reflecting metal films on windows. This leads to poor mobile coverage indoor. No one takes the responsibility for finding a solution. Together with all affected stakeholders the project will determine technology and business models for an open solution that works for new build and retrofit. <u>https://www.acreo.se/projects/inomhustackning-for-</u> <u>mobilkommunikation-i-moderna-energieffektiva- byggnader</u>

List of relevant previous projects or activities, connected to the subject of this proposal

Description of significant infrastructure and major items of technical equipment relevant to the project Not applicable

Large Infra structure Not applicable

4.2 Third parties involved in the project

Subcontracting

The beneficiaries must base their contracts/subcontracts on the 'best value-for-money' considering the quality of the service proposed (also called 'best price-quality ratio') or on the lowest price. Beneficiaries that are 'contracting authorities' or 'contracting entities' (within the meaning of the EU public procurement Directives 2004/18/EC and 2004/17/EC — or any EU legislation that replaces these Directives37) must moreover comply with the applicable national law on public procurement. These rules normally provide for a special procurement procedure for the types of contracts they cover.

Partner 2 UME

Does the participant plan to subcontract certain tasks (please note that core tasks of the project	
should not be sub-contracted)?	Y
Construction and design of energy optimised electric BRT- station (U5, Task 3.3) IT consultant for deve	
of Smart open Data city decision platform (U8) open data release from partners, travel-tool + applicat	tion
development and technical support for installation of traffic sensors(U7, Task 3.3).	
All consultants will be appointed after a public procurement procedure, according to Swedish and EU	
standards. Staff and consultants will cooperate and work together. (Swedish cities do not usually have	
specialist employed, why subcontracting is very common, a standard way of working for public autho	rities in
Sweden). The total amount to be subcontracted is 625.000 euro.	
Does the participant envisage that part of its work is performed by linked third parties?	N
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11	
and 12 of the General Model Grant Agreement)?	Ν

Partner 3 GCC

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)?	
The budget (150.000 euro) will be used for the appointment of legal, financial, and technical consulta	
undertake the required work to establish the business models that will be developed in relation to th	e
transacting of heat and power from the two CHP energy centres in the University of Strathclyde and	
Tennents Caledonian Brewery. These activities are linked to tasks 4.2	
Does the participant envisage that part of its work is performed by linked third parties?	N
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)?	N

Partner 10 UU

Does the participant plan to subcontract certain tasks (please note that core tasks of the project	
should not be sub-contracted)?	Y
ICT and tech. consultant operation for the integration of existing systems with new positioning in a new	
developed decision support system (U5, Task 3.3); Installation ICT equipment and sensors and technical	
support (U9, Task 3.4). The subcontracting will be worth 60.000 euro. All consultants will be appointed after	
public procurement procedure, according to Swedish and EU standards.	
Does the participant envisage that part of its work is performed by linked third parties?	N

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)?

Partner 14 – Parma

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)?	Y
The Municipality needs a specific technical expertise, not available inside the Municipality itself, in or develop the Replication Plan. The experts will act as technical advisor on the integration of energy wi mobility and ICT: they will collect the necessary data to realize the Replication Plan (Task 7.4), and wi feedback from the citizens and stakeholders at local level (Task 5.3). They will also work on the enviro social and economic impacts of the actions undertaken (Task 5.6), also supporting the Municipality we expertise in the funding of energy efficiency and for the investment plan (Task 7.4). Moreover, they worganize specific training sessions in order to engage citizens and stakeholder at a local level and spressolutions to other municipalities on our territory (Tasks 7.1 and 9.6, 9.7). Costs are divided as represented in the following table: WP5, 5.3 and 5.6: 10.000 WP7, 7.1 and 7.4: 5.000	der to th Il collect onmental, ith vill ad the
Does the participant envisage that part of its work is performed by linked third parties?	N
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)?	N

Partner 16 – BN

Does the participant plan to subcontract certain tasks (please note that core tasks of the project Y should not be sub-contracted)?

Within WP2, task 2.1 (Coordination and management of the lighthouse activities) Ballast Nedam is responsible for the technical coordination of the project in Heart of South, Rotterdam. Under supervision of Ballast Nedam a technical specialist will assist Ballast. The amount to be subcontracted is 250.000 euro.

The technical coordinator (BN) makes sure that all the technical aspects of the lighthouse project Heart of South are met. BN will be supported in the following:

- •		
Task	year	Justification - specification
Drafting project	2017	Developing and managing project plans to ensure that local activities are delivered
structure/-		on time and to cost.
organisation and		Coordinating the work of local partners: building owners, users, operators, owners
putting in place the		of open space/area, Eneco/NUON, RET in line with project plans.
right technical		All intended measures are being incorporated into a clear project structure which
management		matches the current state of the separate subprojects (Art Building, swimming
structure		pool, Ahoy, ICC, et cetera).
Business case	2017	A relevant business case will be elaborated for all relevant stakeholders.
exploitation		
Drafting KPI-plan for	2017	In the KPI plan all intended effects from the proposed measures are being
performance		transformed into SMART-KPI's, which in so doing can be coordinated and are
management		verifiable in the course of the entire process.
Programe plan	2017	All projects are brought together in a clear programme plan which is set by all
		relevant stakeholders and in which roles, tasks and responsibilities and a clear
		programme planning are being invested, from which mutual relations of the
		various project components can be deduced. This is particularly important for the
		project components R1A- R1D. In any case, in the programme plan the following
		tasks and responsibilities are being described from the viewpoint of the technical
		coordinator:

		 Commissioning management Verification management Interface management Risk management. In the programme plan also clear agreements are made on (phase) reports, communication and project responsibility. 	
Commissioning	2018-2021	Managing project performance, including collation of required governance paperwork and reporting on local activities in respect of financial, legal, procurement and operational reporting conditions. Commissioning on basis of KPI's. From a commissioning management point of view one sees to it that, concern technical content the right progress with respect to design and realisation is t place and that project management is adequately being performed, whereby there is sufficient time, space and competences in the underlying projects. Commissioning management is taking place based on the drafted KPI-scheme Hereby the KPI's are constantly being monitored. In quarterly reports responsibility and feedback from the commissioning management is being described. This fuels verification, interface and risk management. Preceding t delivery of installations, from the commissioning management point of view procedures for warranty of quality are being described. By doing so the functioning of the intended installations is being monitored, mutually as well relation to the various connected buildings. At least four seasons after deliver test and, if applicable, a readjustment is taking place to see if the KPIs have br achieved.	of ning caking 2. he as in ry a een
Verification	2018- 2021	From the view of verification management all agreed project results during de realisation and until a year after delivery, are being verified by means of a pro- Deviations from the intended performances regarding time, money, informat and organisation are being recorded. Where necessary readjustment will be t place in consultation with the stakeholders involved. Agreements and conclus from the verification management are being recorded. Transparent files are formed.	esign, ocess. tion taking sions
Interface management	2018- 2021	Interface management is of great importance to keep a sharp focus on the maproject dependencies. Problems in the one project can have negative effects the other project, which endangers the intended project performances. Interface in particular to be found on the various sub projects, there where the tota energy balance of the entire project is affected. For instance, asphalt collecto well as the option for surface water have an impact on the entire energy balance of the technical execution of both sub projects, and development the right control engineering is essential in order to achieve good project results and possible deviations which arise from the interface management a being recorded in the quarterly reports	utual on faces al ors as ince. ent of ults. are
Risk management	2018- 2021	In the programme plan a risk file has been incorporated which is composed o basis of input from the various stakeholders. By means of a proper execution commissioning, verification and interface management a big part of these risk will be made manageable. From the viewpoint of risk management the focus particularly be on external risks which are not directly influenced. This particu concerns provision of permits, collaboration of stakeholders, exceeding budg cetera	n the of ks will Jarly et, et
Does the participant e	nvisage	that part of its work is performed by linked third parties?	N
Does the participant e	nvisage	the use of contributions in kind provided by third parties (Articles 11	N

and 12 of the General Model Grant Agreement)?

Partner 20- AHAB

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)?

Y

U2, Task 3.2 – Peak Load variation. The total cost of all the below services are estimated to 65,000€.

System integration consultant, feasibility, design: Technical Consultants (Electric, HVAC and BMS). This is a technical specialist of the specific system – knowledge that we do not have in-house. A specialist needs to design the new system and we also need a specialist to design and prepare the drawings and technical descriptions of the new system. Cost: 22,000€

When installed, the system needs to be evaluated by a specialist for optimisation and replication on larger scale. We do not have this specialist knowledge in-house and are dependent on external consultants. Cost: 12,000€

The specialist consultant needs to train our own engineers in raining in new systems, so that they can operate and maintain it on their own, when installed and running. Cost: 7,000€

Specialist entrepreneurs - (Electric, ventilation and BMS) are to be procured for the installation of the dampers, sensors, control equipment, electrical and communication systems. All needed for the development of the new system. Cost: 24,000€

U4A, 4B, Task 3.2 – Intelligent Building Control: The total cost of all the below services are estimated to 210,000€

U4A –A specialist that will design the new system in cooperation with our own engineers and make a feasibility study on the objects. A specialist contractor for installation of parental control equipment, hardware, and program functions. Cost: 31,000€

Development of the app for controlling room climate, the presence/absence and the integration with control systems. An application developer will be procured. Cost 45,500€

Consultant – (Electric and HVAC) Design, preparation of technical documents for the procurement and installation of dampers, communication systems, sensors and control systems. 51,000€

U4B-Specialist contractor for installation of dampers, sensors and control equipment in the office buildings. Cost: 54,000€

Installation of communication systems and programming features and visualization of SCADA system. Cost: 18,000€

As we do not have this special knowledge in-hose, we also need help with documentation, follow up and training of the new systems for our own personnel, so that they can operate it and maintain it without help from the specialists. 10,500€

U6, Task 3.3 – E charging hub

The total cost of all the below services are estimated to 35,000€

This is new technology for our company and therefore we need external specialist to help us with this. We will procure a consultant for the planning, design and building. A specialist is needed for the system integration and for the evaluation of the result for possible optimizing and upscaling. Cost: 11,000€

Installation of solar panels and integration with battery storage. 5,000€

Specialist are needed for the assembly, encapsulation and installation of the battery storage. Installation of inverters for power wall, based on the DC side + cabling, Power Wall connections, feeds to charging points. Cost: 15,000€

When all installed we need help to evaluate the system. We also need training for our own personnel to run the system and maintain it. Cost: 4,000€

Does the participant envisage that part of its work is performed by linked third parties?	N
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11	
and 12 of the General Model Grant Agreement)?	Ν

Partner 21 – VCC

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)?

Y

Contracting VCC

U1, Task 3.2 – Smart City Connection to 100% renewables. The total cost of all the below services are estimated to 10 000€.

Specialist business consultant to help define and establish optimization boundaries for top load shaving and

energy optimization. Cost: 3000€

System integration consultant, for technical and feasibility, design. $4000 \in$

Training by the specialist consultant for our own personnel so that they can run the system on their own. Cost: 3000€

U2, Task 3.2 – Peak Load variation. The total cost of all the below services are estimated to 10,000€.

System integration consultant, feasibility, design: Technical Consultants (Electric, HVAC and BMS). This is a technical specialist of the specific system – knowledge that we do not have in-house. A specialist needs to design the new system. Cost: 6,000€

The specialist consultant needs to train our own engineers in the new system, so that they can operate and maintain it on their own, when installed and running. Cost: 4,000€

U3, Task 3.2 – Geothermal/cooling storage. The total cost of all the below services are estimated to 15,000€

We need a specialist legal consultant to help us with the financial and cooperative details. This is not the kind of knowledge we have in-house. It is also preferable with someone external to work out the details when setting up business models. Cost: 10,000€

A technical consultant for feasibility and design to support our own personnel. Cost: 5,000€

U4, Task 3.2 – Intelligent Building Control: The total cost of all the below services are estimated to 45,000€ A specialist that will design the new system in cooperation with our own engineers and make a feasibility study on the objects. A specialist contractor for installation of parental control equipment, hardware, and program functions. Cost: 20000€

Installation of communication systems and programming features and visualization of SCADA system. Cost: 20 000€

As we do not have this special knowledge in-house, we also need help with documentation, follow up and training of the new systems for our own personnel, so that they can operate it and maintain it without help from the specialists. 5000€

U6, task 3.3 – E charging hub

The total cost of all the below services are estimated to 10000€

This is new technology for our company and therefore we need external specialist to help us with this. We will procure a consultant for the planning, design and building. A specialist is needed for the system integration and for the evaluation of the result for possible optimizing and upscaling. Cost: 8000€

When all installed we need help to evaluate the system. We also need training for our own personnel to run the system and maintain it. Cost: 2000€

Does the participant envisage that part of its work is performed by linked third parties?	N
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11	
and 12 of the General Model Grant Agreement)?	N

Partner 22 – UEAB

Does the participant plan to subcontract certain tasks (please note that core tasks of the project	
should not be sub-contracted)?	Y
The subcontracting budget (60,000 Euro) is for two smart solutions: U1 and U2. in Task 3.2.	
U1 Smart City connection to 100% renewable energy; Task 3.2 Increase the energy efficiency	
The total subcontract cost amounts to 38,000 Euro.	
The subcontractor assists in developing a new business model to add value to shared energy solutions	s. Steps
to be taken are	

1: Analyzes of peak load and energy durations at an aggregated level of the district.

2. Define and establish optimization boundaries for top load shaving, energy optimization and more.

3. Establish business model testbed: Identify value proposition, cash flow, Stake holder dependencies, risk mitigation and more.

4. Monitor and measure

5. Evaluate and conclusions

U2 Peak load variation management and power control; Task 3.2 Increase the energy efficiency The total subcontracting cost amounts to 22,000 Euro for U2.0 and U2.1

U2.0 Power control (electric Power supply)

Energy optimization includes control of the amount of energy and the energy losses and their cause.

To complement energy metering with power quality measurements provides a basis to show the cause of the energy loss, and then be able to decide on the most cost-effective measures in every load point.

The following steps will be taken by the subcontractor:

- 1: Install monitoring, governing and optimization equipment in the transformer switch gear of the area.
- 2: Develop analytics and control program
- 3: Quality definitions and developing routines
- 4: Measuring , Optimization
- 5: Evaluation and dissemination of results

U2.1 Peak load variation management and power control (District Heating)

Installation of microprocessor based monitoring and governing units in the buildings, which are programmed according to the building physics, tenant activities and earlier consumption patterns. The plan is also to configure the micro processors to communicate with other buildings in a open network cluster, i.e. smart grid. Developing of web based statistics and result sharing. The following steps will be taken:

- 1: Analyze buildings energy consumption patterns and establishing their energy signatures.
- 2: Installation of equipment
- 3: Hook-up and trend logging of baseline data
- 4: Establishing parameter and governing scheme
- 5: Deployment of scheme1, scheme 2 etc.
- 6: Optimization, upgrading of software and other services
- 7: Evaluation and dissemination of results

Does the participant envisage that part of its work is performed by linked third parties?	N
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11	
and 12 of the General Model Grant Agreement)?	N

Partner 32 – WG

Does the participant plan to subcontract certain tasks (please note that core tasks of the project Y should not be sub-contracted)? The subcontracting budget (157,650 euro) is for the installation of domestic demand-side management (DSM)

equipment (smart solution G9, related to smart batteries) in a representative sample of their properties in the district, the monitoring of the results, and the back haul of data from the domestic DSM to the main DSM controller linked to the GCC Central Management System.

G9 is part of the work package 'Challenges and solutions Glasgow' (WP4) and the G9 activities, including the subcontracting, is part of the WP task: Implementation of demand-side management technology in street lighting, in domestic and in non-domestic properties (part of task 4.4 Enabling low-carbon ICT solutions) Does the participant envisage that part of its work is performed by linked third parties? N

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11	Ν
and 12 of the General Model Grant Agreement)?	

Associated with document Ref. Ares(2016)5910251 - 13/10/2016

Section 5 Ethics

5 Ethics and Security

5.1 Ethics

In the European Union, data protection and privacy issues in digital communications is governed by two EU Directives: the EU Directive 95/46/EC on Data Protection (Directive on the protection of individuals with regard to the processing of personal data and on the free movement of such data) and the EU Directive 2002/58/EC on privacy and electronic communications (Directive concerning the processing of personal data and the protection of privacy in the electronic communications sector). EU Directive 2002/58/EC can be considered as a further elaboration of EU Directive 95/46/EC specifically for governing data protection and privacy in digital communications, e.g. internet-based activities. On 25th January 2012, the European Commission unveiled proposals to comprehensively reform and modernise the principles defined in the 1995 EU 95/46/EC Data Protection Directive.

There are two main areas of concern with regard to the ethical management of the RUGGEDISED project:

- The project needs to work in accordance with legal requirements established by the European Commission and national authorities in the work program, in particular concerning <u>personnel data collection and/or</u> <u>processing</u>, <u>data protection and privacy issues</u>.
- The RUGGEDISED project is an Innovation Action project. As such, the project members need to display research integrity in their work, and adhere to common, established research practices, such as intellectual honesty, accuracy and transparency in their project activities.

Each of these areas is of utmost importance to the project consortium and will be assured for through procedures and directives.

Within the RUGGEDISED project, 'processed data' is by definition devoid of any personal or commercially sensitive information. With each processing step, the level of data abstraction increases. The final results, e.g. in the lighthouse city work packages (WP2, 3 and 4), monitoring work package (WP5) and the replication work package (WP7) might contain references to personnel data (energy use, population density, citizen behaviour and energy use, etc...), but these will be represented at a high level of abstraction, devoid of any personal or commercially-sensitive data.

5.1.1 Data handling

Data creation

- 'Data creation' refers to the act of creating new data or acquiring existing data which is new to the project (for example by obtaining existing datasets for use in the project).
- If a consortium partner is the creator of data (e.g. by performing vehicle data collection or demonstrator tests), then the partner is responsible for proper storage, processing and sharing of that data, and ensuring that personal data is purged before further dissemination to the consortium.
- If a consortium partner wishes to use relevant information from a demonstrator test, but is not the creator (e.g. by acquiring relevant datasets or relevant documentation), then the partner is responsible for determining the source of the data and assessing if the dataset contains personal or otherwise privacy- or commercial-compromising or sensitive data. If that is the case, it is the responsibility of the consortium partner to purge personal etc. data from that dataset and prepare it for further dissemination in a proper admissible form.

Handling of personal data

- Personal data (or datasets that contain personal data) gathered by a consortium member remains in the care of that consortium member, and will not be distributed to any other consortium member or any party outside of the consortium.
- In case a dataset contains personal data, it is the responsibility of the consortium partner that created the
 dataset to purge any personal data from the original dataset and create a separate store in which the
 personal data (e.g. identifying information) resides for referencing purposes. Referencing is necessary in
 order to be able to identify the data of a particular individual, should that individual wish to withdraw their

data from use by RUGGEDISED.

The data collected by the systems will all be anonymous. No personal data of drivers will be recorded. It will
not be possible to derive any personal data for the stored data. The data will be stored so the necessary and
accepted data privacy standard are adhered to

Data security

- All consortium shared, processed and operational data will be stored in secure environments at the locations of consortium partners with access privileges restricted to the relevant project partners.
- If (processed) data is to be transferred from one partner to another, care has to be taken to do so in a secure manner, for example via a secure data channel, in an encrypted mode or via physical transfer.

Use of pre-existing data

- During the course of the project, it is possible that the RUGGEDISED team will gain access to data that was
 collected before the start of the project, by an organisation that is not a member of the consortium. In this
 event, the RUGGEDISED partner who receives this data must ensure that there is no information contained
 in it, which could be used to identify individual citizens. Further, the RUGGEDISED partner must be mindful
 of the risks of linking this data, or conclusions resulting from this data with data or conclusions from other
 data sources.
- Informed consent must be obtained when acquiring pre-existing data from external sources.

5.2 Security

This project will not involve activities or results raising security issues, nor will it involve EU classified information as background or results.

6 ANNEX A - Letters of Commitment

6.1 Parma Letter of Commitment





Subject: Letter of Commitment to the Replication and Investment Plan of the project RUGGEDISED, in the context of the SCC-01 2016 Call.

Dear Mrs. Verhoeven,

By signing this letter COMUNE DI PARMA commits to implementing actions in line with those outlined in the Replication and Investment Plan shown in the proposal, and further developed during the execution of the Grant Agreement. Thanks to a programme of mutual knowledge exchange with the other project cities, COMUNE DI PARMA will initiate a long-term process of smart solutions replication after the end of the Grant Agreement, in compliance with the local strategic plans, regulatory and financial framework.

Yours sincerely,

30th March 2016 Pg. n.67575 IV /1.3

To: On behalf of the city of Rotterdam Mrs Paula Verhoeven General Director of Urban Development City of Rotterdam Postbus 6575 3002 AN Rotterdam

6.2 BRNO Letter of Commitment



BRNO

STATUTÁRNÍ MĚSTO BRNO CITY OF BRNO MAYOR Ing. Petr Vokřál

> Brno, 1. April 2016 Ref. No.: MMB/131191/2016

Subject: Letter of Commitment to the Replication and Investment Plan of the project RUGGEDISED, in the context of the SCC-01 2016 Call.

Dear Mrs. Verhoeven,

By signing this letter City of Brno commits to implementing actions in line with those outlined in the Replication and Investment Plan shown in the proposal, and further developed during the execution of the Grant Agreement. Thanks to a programme of mutual knowledge exchange with the other project cities City of Brno will initiate a long-term process of smart solutions replication after the end of the Grant Agreement, in compliance with the local strategic plans, regulatory and financial framework.

Yours sincerely,



On behalf of the city of Rotterdam Mrs Paula Verhoeven General Director of Urban Development City of Rotterdam Postbus 6575 3002 AN Rotterdam

6.3 GDANSK Letter of Commitment

PEŁNOMOCNIK PREZYDENTA MIASTA GDAŃSKA

April, 1 , 2016

From: On behalf of the city of Gdansk Mr Marcin Dawidowski Mayor's Plenipotentiary for European Projects Nowe Ogrody 8/12 80-803 Gdansk Poland

To: On behalf of the city of Rotterdam Mrs Paula Verhoeven General Director of Urban Development City of Rotterdam Postbus 6575 3002 AN Rotterdam

Subject: Letter of Commitment to the Replication and Investment Plan of the project RUGGEDISED, in the context of the SCC-01 2016 Call.

Dear Mrs. Verhoeven,

By signing this letter the city of Gdansk commits to implementing actions in line with those outlined in the Replication and Investment Plan shown in the proposal, and further developed during the execution of the Grant Agreement. Thanks to a programme of mutual knowledge exchange with the other project cities the city of Gdansk will initiate a long-term process of smart solutions replication after the end of the Grant Agreement, in compliance with the local strategic plans, regulatory and financial framework.

Yours sincerely

Marcin Dawidowski Mayor's Plenipotentiary for European Projects

Siedzība: ul. Kartuska 5, 80-103 Gdańsk Adres do korespondencji: ul. Nowe Ogrody 8/12, 80-803 Gdańsk; tel.: 58 526 80 24, fax: 58 526 80 01, e-mail: joanna.zbierska@gdansk.gda.pl; www.gdansk.pl ISO 9001:2008

7 Annex B Covenant of Mayors - Sustainable Energy Action Plan (SEAP)

7.1 Rotterdam - Covenant of Mayors - SEAP

See website: Covenant of Mayors for Climate & Energy

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Pending clarifications re	equested			D De the	ownloa	d Mayors text
Signatories	Council deliberation	Commitments	Analysis Status	🗐 Latest B	enchmar	ks
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				Lainate, Italy ACQUISTO DI EN PER EDIFICI PUB	ERGIA VERDE BLICI	E CERTIFICATA
				Morimondo, Italy New efficient build	ngs	
				& Covena	nt of Mayo	ors Office
					021	

7.2 Umeå - Covenant of Mayors – SEAP

See website: Covenant of Mayors for Climate & Energy

C fc	ovenant of I or Climate &	Mayors Energy		Covenanto	fmayors.eu l	My Covenant
ගි About A	Actions Participation	Support M	/ledia	Search	OK	English (en)
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Search for a Sus Sweden 2009	stainable Energy Action Plan tainable Energy Action Plan	Commitments Accepted s found.	ок У	Find a Signatory		And
Pending clarifica	tions requested			D the	ownloa Covenant of M	d Mayors text
Signatories	Council deliberation	Commitments	Analysis Status	Latest E	Benchmarl	ks
Finspäng, SE Umeå, SE	25 Nov 2009 28 Sep 2009	2020	Ø	Morimondo, Italy		
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				8 Covena	nt of Mayo	ors Office

7.3 Glasgow - Covenant of Mayors – SEAP

See website: Covenant of Mayors for Climate & Energy



8 Annex C Letter of Support

8.1 Portland - Letter of Support



March 31, 2016

City of Rotterdam City Development Attn. Mrs. P.W. Verhoeven P.O.Box 6575 3002 AN Rotterdam The Netherlands pw.verhoeven@rotterdam.nl

SCC-1-2016-2017 Innovation Action for Smart Cities and Communities lighthouse projects Project Name: RUGGEDISED

LETTER OF SUPPORT

Dear Mrs Verhoeven,

I would like to express the interest and the agreement of the City of Portland, Oregon, USA, in partnership with Portland State University, to establish synergies with the proposal RUGGEDISED coordinated by the City of Rotterdam and to take part in the Cities Interest Group that is foreseen in the project. The City of Portland is interested in connecting to the RUGGEDISED project regarding the development of Smart Cities and Communities in Europe.

Portland has a long history of policy innovation in transportation, energy, and low-carbon development, and emerging smart cities technologies and practices create new opportunities to accelerate Portland's goals to improve equity, livability, and environmental quality. European cities are testing innovative strategies that use data and coordination to reduce carbon emissions and improve affordability, and Portland can learn from and contribute to these efforts, accelerating their replicability and leading to greater global impact.

We will retain in strictest confidence and shall not use for other purposes than the one of the Consortium, all confidential matters known to us, other than disclosures required by Oregon Public Records Law. In the event that the European Commission accepts the proposal, we agree to act in accordance with the contract to be signed by the European Commission and the city of Rotterdam on our behalf.

Susan Anderson

Susan Anderson Director



City of Portland, Oregon | Bureau of Planning and Sustainability | www.portlandoregon.gov/bps 1900 SW 4th Avenue, Suite 7100, Portland, OR 97201 | phone: 503-823-7700 | fax: 503-823-7800 | tty: 503-823-6868

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9 Annex D Lighthouse Cities – BEST Tables

9.1 Partner 1: City of Rotterdam

Lighthouse City - Rotterdam

BEST Rotterdam Zero Energy Residential Buildings - 100

BEST Rotterdam Art Building – Theatre and library

BEST Rotterdam Other type - Exibition Center Ahoy

BEST Rotterdam Other Type - Swimming pool Retrofit

BEST Rotterdam Other Typre - International Congress Centre

Building	Energy Specification	Table (BEST)	Community / site	NL - Rotterdam	BEST no		
(to be complet 1,1	Building Category [1 description	ry of proposed building) 100 Zero Energy residential buildings	tota a Acetegoria	ates with to Con	ment Ref. Ar	es(2016)59900	51 - 13/10/2016
1,2	Local Climate		January average out	side temperature	℃ 	3,1	
	Climatic Zone (national definition)	sea climate zeeklimaat	Average global horiz Annual heating degr	contal radiation ee days [3]	kWh/m² yr °Cd/yr	1050 185	
1,3	Maximum requirements of bu	uilding fabric	Existing building [5]	National regulation for new built [6]	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Reduction %
	Façade/wall U Roof U Ground floor U Glazing Ug Average U-value Uav Glazing g Shading Fs Ventilation rate [4] Ventilation	W / m2K W / m2K W / m2K W / m2K W / m2K total solar energy transmittance of glazing [%] Shading correction factor air changes/hr	new new new new new new new new	0,22 0,17 0,29 1,65 0,61 - - 2	0,22 0,17 0,29 1,65 1,65 2	0,17 0,13 0,20 0,90 0,90 35% 0,80 2	25% 20% 30% 45% 45% 0% 0% 0%
2	Building Energy Performance	e					
2,1	Energy demand per m2 of to	tal used conditioned floor area (kWh / m2yr) in	cl. system losses		National		
energy carrier existing building	suggested energy carrier	specify energy efficiency measures	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Additional energy savings
Heating + ver electricity	electricity kWh/m²yr	insulation, heat recovery	new		5,0	4,0	19%
Cooling + ver	ntilation						
electricity	electricity kWh/m ² yr	passive measurements	new		2,8	1,7	40%
Ventilation (if electricity	separate from heating/cooling) electricity kWh/m ² yr	high frequency	new		1,8	1,0	46%
Lighting	Let Mile Jacob		·				
Domestic Hot	t Water (DHW)	nign frequency	new		8,0	4,5	44%
electricity	electricity kWh/m ² yr	water saving taps, leakage indicators	new		12,5	13,5	-8%
	kWh/m ² yr						0%
	kWh/m²yr	Subtotal sum of energy demand	new		30,10	24,58	18%
	Appliances (please indicate, b	out costs are not eligible)					
2.2	electricity kWh/m²yr	otal used conditioned area (kWh / m2 ur)					
total production kWh/yr	kW m ² installed installed	specify RES measures	New or existing building [5]	National regulation for new built [6]	National regulation for refurbished buildings or normal	suggested specification [7]	RES increased contribution [%]
594000	4000 660	Photovoltaics	new		5,7	45,7	
							-
	kWh/m²yr	Subtotal sum of RES contribution	new	0	5,7	45,7	702%
3	Building Energy Use	per m ² of total conditioned/heated floor area (kV	Vh/m2 yr)		National regulation for		
	kWh/m²yr	Subtotal sum of energy demand	New or existing building [5] new	National regulation for new built [6] 0	regulation for refurbished buildings or normal practice (6a)	suggested specification [7] 25	improvement from regulation for refurbished/normal practice 5,52
	kWh/m²yr	Subtotal sum of RES contribution	new	0	6	46	0,00
	kWh/m ⁻ yr	Total Building Energy Use	new	0	24	-21	5,52
4	Other national overall energy	/ performance targets or criteria (additional info	rmation, mandatory if e	existing)	national regulation for		
	Units [8]	explain content and scale [9]	Existing building	National regulation for new built	refurbished buildings or normal practice	suggested specification	

1.1	Building Catego	ry [1 other	total area	egquy	soffiateed with	document F	Ref_Ares(2004	ŊĴ5910251 - 13/10/2
		description	Art building: Theatre and library						
1.2	Local Climate			January aver	age outs	side temperature	ວ° ວ°	3.1	
	Climatic Zone		sea climate	Average glob	al horizo	ontal radiation	kWh/m ² yr	1,050	
	(national definition	ר)	zeeklimaat	Annual heatin	ng degre	ee days [3]	°Cd/yr	185	
							National		
							regulation for refurbished		
				New or existing		National regulation for new	buildings or normal	suggested	
1.3	Maximum requir	ements of b	uilding fabric	building [5]		built [6]	practice (6a)	specification [7]	Reduction %
	Façade/wall	U	W / m2K	new	コ	0.22	0.22	0.2	10%
	Root Ground floor	U	W / m2K W / m2K	new new	_	0.17	0.17	0.17	30%
	Glazing	Ug	W / m2K	new	_	1.65	1.65	1.25	24%
	Average U-value Glazing	g Uav	total solar energy transmittance of glazing [6] new	-			30%	0%
	Shading Ventilation rate [4]	Fs	Shading correction factor air changes/hr	new	-	2	2	0.8 2.5	0%
			,						
2	Building Energy	Performanc	ce						
2.1	Energy demand	per m2 of to	otal used conditioned floor area (kWh / m2y	r) incl. system loss	3es		National		
energy							regulation for refurbished		
carrier	suggested			New or		National	buildings or	suggested	Additional onormy
building	carrier		specify energy efficiency measures	building [5]		built [6]	practice (6a)	specification [7]	savings
leating + ven	tilation								
	DH	kWh/m²yr	insulation, heat recovery, efficient pumps	new			38.7	27.9	28%
Cooling + ven	ntilation			-, 		·			
	electricity	kWh/m²yr	efficient pumps and motors	new			6.4	5.0	21%
/entilation (if	separate from heat	ing/cooling)		r	-		<u> </u>	i	08
in héin n		KVVII/III yi							
Ignting	electricity	kWh/m²vr	high frequency	new	٦		45.0	35.0	22%
omestic Hot	Water (DHW)		ngi noquonoy				10.0	00.0	
		kWh/m²yr	water saving taps and leakage sensors	new	٦		2.2	1.4	36%
Other energy	demand								
		kWh/m²yr							0%
		2							
		kWh/m²yr	Subtotal sum of energy demand	new		0	92.2	69.3	25%
	Appliances (plea	se indicate, b	out costs are not eligible)						
	electricity	kWh/m²yr							
2.2	RES contribution	n per m2 of t	total used conditioned area (kWh / m2 yr)						
							regulation for refurbished		
total production		kW		New or existing		National regulation for new	buildings or normal	suggested	RES increased
. kWh/yr	m ² installed	installed	specify RES measures	building [5]	-	built [6]	practice (6a)	specification [7]	contribution [%]
222750	1500	247.5	Photovoltaics	new	_			10.7	0%
				- ┣	-			·	0%
									0%
		kWh/m²yr	Subtotal sum of RES contribution	new		0	0	16.7	0%
			2						
3	Building Energy	Use	per m ² of total conditioned/heated floor area	(kWh/m2 yr)			National		
				New or		National	refurbished buildings or		improvement from regulation for
				existing building [5]		regulation for new built [6]	normal practice (6a)	suggested specification [7]	refurbished/normal practice
		kWh/m ² yr	Subtotal sum of energy demand	new	7	0	92	69	22.93
		кvvn/m ⁻ yr	Subtotal sum of RES contribution	new		0	0	17	0.00
		kWh/m ² yr	Total Building Net Energy Use	new		56	92	53	22.93
		vorall opora	v performance targets or criteria (additional	information, mandat	tory if ex	kisting)			
4	Other national o	verall ellerg	· · · · · · · · · · · · · · · · · · ·				Notional		
4	Other national o	veran energ	, provinsi in gran a contra (National regulation for		
4	Other national o	verall energ	, p	New or		National	National regulation for refurbished buildings or	suggested	
4	Other national o	Units [8]	explain content and scale [9]	New or existing building [5]	_	National regulation for new built	National regulation for refurbished buildings or normal practice	suggested specification	

Building	Energy Speci	fication	Table (BEST)	Community / site	NL - Rotterdam	BEST no	D	
(10 be complet 1.1	Building Category	description	other Exhibition Center Ahoy	total ar atages	gefatedeavitan d	ocument Re	f. Ares(203.0069	Ĵ10251 - 13/10/2016
1.2	Local Climate			January average ou	itside temperature	°C	3.1	
	Climatic Zone		sea climate	August average out	side temperature	°C kWh/m² vr	17.2	
	(national definition))	zeeklimaat	Annual heating deg	ree days [3]	°Cd/yr	185	
				Existing	National regulation for new	National regulation for refurbished buildings or normal	suggested	
1.3	Maximum require	ments of bu	uilding fabric	building [5]	built [6]	practice (6a)	specification [7]	Reduction %
	Façade/wall	U	W / m2K	new&existing	0.22	0.6	0.22	63%
	Roof Ground floor	U	W / m2K W / m2K	new&existing	0.17	2.04	0.17	86%
	Glazing	Ug	W / m2K	new&existing	1.65	1.65	0.90	45%
	Average U-value	U _{av}	W / m2K	new&existing	0.61	1.46	0.61	58%
	Shading	Fs	Shading correction factor	new&existing	-	0.70	0.80	-14%
	Ventilation rate [4]		air changes/hr	new&existing	2	2.2	1.8	18%
2	Building Energy P	Performance	e					
2.1	Energy demand p	er m2 of to	tal used conditioned floor area (kWh / m2yr) ir	icl. system losses		National		
energy						regulation for		
carrier	suggested			New or	National	buildings or		
existing building	energy carrier		specify energy efficiency measures	existing building [5]	regulation for new built [6]	normal practice (6a)	suggested specification [7]	Additional energy savings
Heating + ver	ntilation							
as, electricity	DH, electricity	kWh/m²yr	insulation, heat recovery	new&existing		62.8	42.1	33%
Cooling + ver	ntilation							
		kWh/m²yr						0%
Ventilation (if	separate from heatir	ng/cooling)						
		kWh/m²yr						0%
Lighting	electricity	kWh/m²yr	hiah frequency	new&existing	[]	81.6	61.2	25%
Domestic Hot	t Water (DHW)			<u> </u>				
		kWh/m²yr	water saving taps					0%
Other energy	demand							
		kWh/m²yr						0%
		kWh/m²yr	Subtotal sum of energy demand	new&existing	0	144.4	103.3	29%
	Appliances (pleas	e indicate, b	ut costs are not eligible)					
	electricity	kWh/m²yr						
2.2	RES contribution	per m2 of t	otal used conditioned area (kWh / m2 yr)					
4-4-1				Name	Matterial	regulation for refurbished		
production	2	kW		existing	regulation for new	normal	suggested	RES increased
kWh/yr 297000	m ² installed 2000	installed 330	specify RES measures Photovoltaics	building [5] new&existing	built [6]	practice (6a)	specification [7] 12.7	contribution [%]
								-
								-
								-
		kWh/m²yr	Subtotal sum of RES contribution	new&existing	0	0	12.7	-
3	Buildina Enerav I	Jse	per m ² of total conditioned/heated floor area (k)	Wh/m2 yr)				
	0 07			• /		National regulation for		improvement from
				New or existing	National regulation for new	buildings or	SUNNESTER	regulation for refurbished/pormal
				building [5]	built [6]	(6a)	specification [7]	practice
		kWh/m ² yr kWh/m ² yr	Subtotal sum of energy demand	new&existing	0	144	103	41.16
				nonceribuly	0	<u>_</u>		0.00
		kWh/m ² yr	Total Building Energy Use	new	0	144	91	41.16
4	Other national over	erall energy	v performance targets or criteria (additional info	ormation, mandatory if	existing)			
						National		
						regulation for refurbished		
				Existing	National regulation for new	buildings or normal	suggested	
		Units [8]	explain content and scale [9]	building	built	practice	specification	
					_			

Building	Energy Spec	ification	Table (BEST)	Community / site	NL-Rotterdam	BEST no).	
(to be complet 1.1	Building Categor	y [? description	1 other Swimming Pool retrofit	total 🦳 / 🗚 🌚 🔊 🖓	vi btet dswith[2doc	ument Ref. /	A <u>res(2016),500</u> 10	Ĵ251 - 13/10/2016
1.2	Local Climate			January average out	side temperature	℃ ℃	3.1 17.2	
	Climatic Zone		sea climate	Average global horizo	ontal radiation	kWh/m ² yr	1050	
	(national definition)	zeeklimaat	Annual heating degre	ee days [3]	°Cd/yr	185	
				New or existing	National regulation for new	National regulation for refurbished buildings or normal	suggested	
1.3	Maximum require	ements of bi	uilding fabric	building [5]	built [6]	practice (6a)	specification [7]	Reduction %
	Façade/wall Roof	U U	W / m2K W / m2K	new&existing new&existing	0.22	0.77	0.53	31% 78%
	Ground floor Glazing	U Ua	W / m2K W / m2K	new&existing new&existing	0.29	1.30 3.20	1.30 1.65	0% 48%
	Average U-value	U _{av}	W / m2K					0%
	Glazing Shading	g Fs	total solar energy transmittance of glazing [%] Shading correction factor	new&existing new&existing	- 1.00	1.00 0.80	0.60	40%
	Ventilation rate [4]		air changes/hr	new&existing	2.00	2.00	2.67	-33%
2	Building Energy	Performanc	e					
2.1	Energy demand	per m2 of to	tal used conditioned floor area (kWh / m2yr) in	icl. system losses		National		
energy carrier existing building	suggested energy carrier		specify energy efficiency measures	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Additional energy savings
Heating + ver	ntilation							
as, electricity	DH, Electricity	kWh/m²yr	insulation, heat recovery, efficient pumps	new&existing		198.5	150.0	24%
Cooling + ve	ntilation							
Electricity	Electricity, DH	kWh/m ² yr	efficient pumps and motors	new&existing		59.0	42.1	29%
Ventilation (if	separate from heati	ing/cooling)	[
Electricity	Electricity	KVVN/M Yr	efficient pumps and motors	new&existing		176.3	123.4	30%
Lighting	electricity	kWh/m²yr	LED luminaires	new&existing		810.0	502.2	38%
Domestic Ho	t Water (DHW)			<u>.</u>				
Gas	Electricity, DH	kWh/m²yr	water saving taps and leakage indicators	new&existing		210.1	135.0	36%
Other energy	demand							
Electricity	Electricity	kWh/m ² yr	covering of pool-water	new&existing		85.0	64.0	25%
		kWh/m²yr	Subtotal sum of energy demand	new&existing	0.0	1538.9	1016.8	34%
	Appliances (pleas	se indicate, b	out costs are not eligible)					
	electricity	kWh/m ² yr						
2.2	RES contribution	n per m2 of t	otal used conditioned area (kWh / m2 yr)					
						regulation for refurbished		
total production		kW		New or existing	National regulation for new	buildings or normal	suggested	RES increased
kWh/yr 297000	m ² installed 2000	installed 330	specify RES measures Photovoltaics	building [5] new&existing	built [6]	practice (6a)	specification [7] 21.2	contribution [%]
								0%
								0%
								0%
		kWh/m ² yr	Subtotal sum of RES contribution	new&existing	0	0	21.2	0%
3	Building Energy	Use	per m ² of total conditioned/heated floor area (kV	Vh/m2 yr)				
						National regulation for refurbished		improvement from
				New or existing	National regulation for new	buildings or normal practice	suggested	regulation for refurbished/normal
		kW/b/m ² /r	Subtotal sum of operau demand	building [5]	built [6]	(6a)	specification [7]	practice
		kWh/m ² yr	Subtotal sum of RES contribution	new&existing	0	0	21	0.00
		kWh/m ² yr	Total Building Energy Use	new&existing	0	1454	997	436.17
4	Other national ov	verall energy	y performance targets or criteria (additional info	rmation, mandatory if ex	xisting)			_
					N. 6. 1	National regulation for refurbished		

				regulation for refurbished	
			National	buildings or	
	I	Existing	regulation for new	normal	suggested
Units [8] explain c	ontent and scale [9]	building	built	practice	specification

to be complete	ed for every diffrent type	cation	Table (BEST)	Community / site	NL-Rotterdam	BEST no	0.	l
1.1	Building Category des	[1 scription	International Congress Centre	total area	\$®F\$FB\$tend" With	document F	ef Ares (2913201	ም5910251 - 13/10/2
1.2	Local Climate			January average ou	tside temperature	°C	3.1	
	Climatic Zone		sea climate	August average outs	side temperature	°C kWh/m ² vr	17.2	
	(national definition)		zeeklimaat	Annual heating degr	ee days [3]	°Cd/yr	185	
						National regulation for		
				New or	National	refurbished buildings or		
1.3	Maximum requirement	nts of bu	uilding fabric	existing building [5]	regulation for new built [6]	normal practice (6a)	suggested specification [7]	Reduction %
	Façade/wall	U	W / m2K	new	0.22	0.22	0.2	10%
	Roof Ground floor	U	W / m2K W / m2K	new	0.17	0.17	0.17	0%
	Glazing	Ug	W / m2K	new	1.65	1.65	1.25	24%
	Average U-value	U _{av}	W / m2K	new			30%	0%
	Shading	Fs	Shading correction factor	new	2.5	2.5	0.8	0%
	ventilation rate [4]		all changes/ni	new	2.3	2.5	2.5	0%
2	Building Energy Perf	ormance	9					
2.1	Energy demand per r	m2 of tot	al used conditioned floor area (kWh / m2yr) in	cl. system losses		National		
energy						regulation for refurbished		
carrier existing	suggested energy			New or existing	National regulation for new	buildings or normal	suggested	Additional energy
building	carrier		specify energy efficiency measures	building [5]	built [6]	practice (6a)	specification [7]	savings
eating + ven	tilation							
	DH kW	h/m²yr	insulation, heat recovery, efficient pumps	new		18	14	22%
ooling + ven	ntilation	'h/m²vr	efficient numps and motors	new	·	3	2	33%
entilation (if	separate from heating/c	nonina)		now		0	2	
	kW	'h/m²yr						0%
ighting								
	electricity kW	'h/m²yr		new		21	16	24%
omestic Hot	Water (DHW)							
	kW	'h/m²yr		new		1	1	0%
ther energy	demand kW	'h/m²vr				r1		0%
I		, .						
	kW	'h/m²yr	Subtotal sum of energy demand	new	0	43	33	23%
	Appliances (please in	dicate, b	ut costs are not eligible)					
	electricity kW	h/m²yr						
2.2	RES contribution per	r m2 of t	otal used conditioned area (kWh / m2 yr)			regulation for refurbished		
total production	kW			New or existing	National regulation for new	buildings or normal	suggested	RES increased
kWh/yr 245025	m ² installed inst	talled 272.3	specify RES measures	building [5] new	built [6]	practice (6a)	specification [7] 8 4	contribution [%]
			,					0%
								0%
								0%
	kW	'h/m²yr	Subtotal sum of RES contribution	new	0	0	8.4	0%
3	Building Energy Use		per m^2 of total conditioned/heated floor area (kV	Vh/m2 yr)		National		
				New or	National	regulation for refurbished buildings or		improvement from regulation for
				existing building [5]	regulation for new built [6]	normal practice (6a)	suggested specification [7]	refurbished/normal practice
	kW	h/m²yr	Subtotal sum of energy demand	new	0	43	33	10.00
	ĸW	n/m ⁻ yr	Subtotal sum of RES contribution	new	0	0	8	0.00
	kW	'h/m²yr	Total Building Net Energy Use	new	25	43	25	10.00
4	Other national overal	ll energy	performance targets or criteria (additional info	rmation, mandatory if e	xisting)			
						National regulation for		
				New or	National	buildings or	suggested	
	Uni	its [8]	explain content and scale [9]	building [5]	built	practice	specification	ı
						⊢ −−− ∤		

9.2 Partner 2: City of Umeå

Lighthouse City – Umeå

BEST Umeå University building with laboratory
Building Energy Specification Ta	ble (BEST)			Community / site	Umeå	BEST no	J.	
(to be completed for every diffrent type/category of 1,1	proposed building) Building Category	[description	University building with laboratory	total area / category with docur	/ BEST sheet [2]	Ares(2016)5910251	¹ 13/10/2016
1,2	Local Climate			January average out	side temperature	°C	-8	
	Climatic Zone (national definition)		Sweden Climate Zone 1 according to Swedish building regulations	August average outs Average global horiz Annual heating degr	side temperature ontal radiation ee days [3]	°C kWh/m² yr °Cd/yr	15 881 4855	
1,3	Maximum requirements of buik	ding fabric		New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Reduction %
	Façade/wall	U	W / m2K	0,3			0,3	0%
	Roof Ground floor Glazing Average U-value Glazing Shading Ventilation rate [4	U U U _g U _{av} g Fs	W / m2K W / m2K W / m2K U / m2K total solar energy transmittance of glazing [%] Shading correction factor air changes/hr	0,21 0,23 2,5 0,45 0,5 	0,6	0,6	0,21 0,23 2,5 0,45 0,5 0,67	0% 0% 25% 0% 0% 0%
2	Building Energy Performance						-	
2.1	Energy demand per m2 of total	used condit	ioned floor area (kWh / m2vr) incl. system losses					
energy carrier existing building	suggested energy carrier		specify energy efficiency measures	New or existing building [5]	National regulation for new built [6]	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Additional energy savings
Heating + ventilation		-,						
District heating/Heat pump	District heating/Heat pump	kWh/m²yr	New heat recovery, new fans, demand control system. Only the dem	na 124			88	0%
Cooling + ventilation	District on the	k)M/h /m²2 m	Demonderated		r			00/
District cooling	District cooling	KVVII/III YI	Demand control	9			8	0%
Ventilation (if separate from heating/cooling)		kWh/m ² vr						0%
Lighting				11			LI	070
Lighting	electricity	kWh/m²yr		<u> </u>				0%
Domestic Hot Water (DHW)				· · · · · ·				
		kWh/m²yr						0%
Other energy demand								
Electricity building services	Electricity	kWh/m²yr	Demand control	31			26	0%
		kWh/m ² yr	Subtotal sum of energy demand	164	159	159	122	23%
	Appliances (please indicate, but	costs are not	eliaible)					
	electricity	kWh/m ² yr						
2,2	RES contribution per m2 of tota	al used cond	litioned area (kWh / m2 yr)					
total production kWh/yr	m ² installed	kW installed	specify RES measures	New or existing building [5]	National regulation for new built [6]	National regulation for refurbished buildings or normal	suggested specification [7]	RES increased contribution [%]
								0%
								0%
								0%
		kWh/m ² yr	Subtotal sum of RES contribution	0	0	0	0	0%
2	Building Engrave Line		$r = r^2 + (t_1 + t_2) = r^2 + (t_1 + t_2) = r^2 + (t_1 + t_2) = r^2$					
3	building Energy Use		per m or total contonioned/neared noor area (kwi timiz yr)	New or existing building [5]	National regulation for new built [6]	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	improvement from regulation for refurbished/normal practice
		kWh/m ² yr	Subtotal sum of energy demand	164	159	159	122	37,00
		kW/b/m-2 -	Total Ruilding Net Engrand Lag					0,00
		kvvn/m ⁻ yr	Total building Net Energy Use	164	159	159	122	37,00
4	Other national overall energy p	erformance	targets or criteria (additional information, mandatory if existing)					
*	natorial overall energy p		general anterna (consideral anomation, mandelory a colstilly)	New or	National	regulation for refurbished buildings or		
		Units [8]	explain content and scale [9]	existing building [5]	regulation for new built	normal practice	suggested specification	
						_		

9.3	Partner 3: City of Glasgow
Ligh	thouse City – Pamplona
BEST	Glasgow Social Housing – Drygate CN9A
BEST	Glasgow Social Housing – Drygate CN9B
BEST	Glasgow Social Housing – Drygate CN9C
BEST	Glasgow Social Housing – Drygate CN9D
BEST	Glasgow Social Housing – Drygate CN10A
BEST	Glasgow Social Housing – Drygate CN10B
BEST	Glasgow Social Housing – Drygate CN10C
BEST	Glasgow Social Housing – Drygate CN11A
BEST	Glasgow Social Housing – Drygate CN11B
BEST	Glasgow Social Housing – Drygate CN11C
BEST	Glasgow Social Housing – Drygate CN11D
BEST	Glasgow Social Housing – Drygate MSCN1
BEST	Glasgow Social Housing – Drygate MSCN2
BEST	Glasgow Social Housing – Drygate MSCN3
BEST	Glasgow Local Authority Office Building – GCC 231 George St.
BEST	Glasgow Local Authority Office Building – GCC Exchange House
BEST	Glasgow Local Authority Office Building – GCC City Chambers
BEST	Glasgow Local Authority Office Building – GCC Montrose St.

Building	Energy Specifi	cation ⁻	Table (BEST)	Community / site	Drygate - CN9A	BEST no). 		
(to be complete 1.1	Building Category de	e/category [1] scription	residential retrofitted Social Housing	total area / cate	BASSOCIAted	with docun	n ent Ref. Ave s	2016)5910251	- 13/10/2016
1.2	Local Climate Climatic Zone (national definition)		Oceanic (Köppen climate classification)	January average out August average outs Average global horiz Annual heating degre	side temperature side temperature contal radiation ee days [3]	°C °C kWh/m² yr °Cd/yr	3 15 860 2741		
1.3	Maximum requireme Façade/wall Roof Ground floor Glazing Average U-value Glazing Shading Ventilation rate [4]	ents of bui U U U U U g Fs	ding fabric W / m2K W / m2K W / m2K W / m2K W / m2K total solar energy transmittance of glazing [%] Shading correction factor air changes/hr	New or existing building [5] 0.27 0.18 0.2 1.8 0.3 7 7 7	National regulation for new built [6] 0.25 0.18 0.29 1.8 0.29 7 7 7 7	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7] 0.27 0.18 0.2 1.8 0.3 7 7 7	Reduction %	
2	Building Energy Per	formance							
2.1 energy carrier existing building	Energy demand per suggested energy carrier	m2 of tota	I used conditioned floor area (kWh / m2yr) inc specify energy efficiency measures	I. system losses New or existing building [5]	National regulation for new built [6]	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Additional energy savings	
Heating + ven	tilation District Heating - Gas- fired CHP kV	Vh/m²yr	Smart meters, smart controls	71.03311913			71.03311913	0%	
Cooling + ven	tilation kV	Vh/m ² yr						0%	
Ventilation (if	separate from heating/o	cooling) Vh/m ² yr						0%	
Lighting	electricity kV	Vh/m²yr						0%	
Domestic Hot Electricity Other energy	Water (DHW) District Heating - Gas- fired CHP kV demand	Vh/m²yr	Smart meters, smart controis	37.2219476			37.2219476	0%	
	kV	Vh/m²yr Vh/m²vr	Subtotal sum of energy demand	108.2550667	0	0	108.2550667	0%	
	Appliances (places in	adiaata hut	costs are not clisible)			·			
	electricity kV	Vh/m ² yr	Demand-side management in some properties, but no overally energy savings assumed - load shifting.	60			60	0%	
total production kWh/yr	m ² installed kV kV kV	V stalled Vh/m ² yr	specify RES measures Subtotal sum of RES contribution	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	RES increased contribution [%] 0% 0% 0%	
3	Building Energy Use kV kV	9 Vh/m ² yr Vh/m ² yr Vh/m ² yr	per m ² of total conditioned/heated floor area (kW Subtotal sum of energy demand Subtotal sum of RES contribution Total Building Net Energy Use	New or existing building [5] 108.2550667 0 108.2550667	National regulation for new built [6] 0 0	National regulation for refurbished buildings or normal practice (6a) 0 0	suggested specification [7] 108.2550667 0 108.2550667	improvement from regulation for refurbished/normal practice 0.00 0.00	
4	Other national overa	all energy p	performance targets or criteria (additional inform	nation, mandatory if ex	isting)	National regulation for refurbished			

Ur	nits [8] e	explain content and scale [9]	New or existing building [5]	National regulation for new built	buildings or normal practice	suggested specification

Building	Energy Specifi	cation ⁻	Table (BEST)	Community / site	Drygate - CN9B	BEST no). 		
(to be complete 1.1	Building Category	e/category [1] escription	residential retrofitted Social Housing	total area / cate	BASSOCIEted	with docun	n ent Ref. Aff e	2016)5910251	- 13/10/2016
1.2	Local Climate Climatic Zone (national definition)		Oceanic (Köppen climate classification)	January average out August average outs Average global horiz Annual heating degre	tside temperature side temperature zontal radiation ee days [3]	°C °C kWh/m² yr °Cd/yr	3 15 860 2741		
1.3	Maximum requireme Façade/wall Roof Ground floor Glazing Average U-value Glazing Shading Ventilation rate [4]	U U U U U g Fs	Iding fabric W / m2K W / m2K W / m2K W / m2K W / m2K total solar energy transmittance of glazing [%] Shading correction factor air changes/hr	New or existing building [5] 0.27 0.18 0.2 1.8 0.3 7 7 7	National regulation for new built [6] 0.25 0.18 0.29 1.8 0.29 7 1 1 7	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7] 0.27 0.18 0.2 1.8 0.3 7 7 7	Reduction %	
2	Building Energy Per	formance							
2.1 energy carrier existing building	Energy demand per suggested energy carrier	m2 of tota	I used conditioned floor area (kWh / m2yr) inc specify energy efficiency measures	I. system losses New or existing building [5]	National regulation for new built [6]	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Additional energy savings	
Heating + ven	tilation District Heating - Gas- fired CHP kV	Vh/m²yr	Smart meters, smart controls	71.03311913			71.03311913	0%	
Cooling + ven	tilation	N/h /m ² . m		·	·		·	00/	
Ventilation (if	separate from heating/	cooling)						0%	
	kV	Vh/m²yr						0%	
Lighting	electricity kV	Vh/m²yr						0%	
Electricity Other energy	District Heating - Gas- fired CHP kV	Vh/m ² yr	Smart meters, smart controls	37.2219476			37.2219476	0%	
	kV	Vh/m⁻yr		·	I		· ·	0%	
	k٧	Vh/m ² yr	Subtotal sum of energy demand	108.2550667	0	0	108.2550667	0%	
	Appliances (please i electricity kV	ndicate, but Vh/m ² yr	t costs are not eligible) Demand-side management in some properties, but no overally energy savings assumed - load shifting.	60			60	0%	
2.2 total production kWh/yr	m ² installed kV	V stalled Wh/m ² yr	specify RES measures Subtotal sum of RES contribution	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	RES increased contribution [%] 0% 0% 0% 0%	
3	Building Energy Use kt kt	∍ Vh/m²yr Vh/m²yr Vh/m²yr	Subtotal sum of energy demand Subtotal sum of energy demand Subtotal sum of RES contribution	New or existing building [5] 108.2550667 0 108.2550667	National regulation for new built [6] 0 0	National regulation for refurbished buildings or normal practice (6a) 0 0	suggested specification [7] 108.2550667 0 108.2550667	improvement from regulation for refurbished/normal practice 0.00 0.00	
4	Other national over	all energy p	performance targets or criteria (additional inforr	nation, mandatory if ex	risting)	National regulation for refurbished			

Ur	nits [8] e	explain content and scale [9]	New or existing building [5]	National regulation for new built	buildings or normal practice	suggested specification

Building	Energy Specifi	cation ⁻	Table (BEST)	Community / site	Drygate - CN9C	BEST no). 		
(to be complete 1.1	Building Category	e/category [1] escription	residential retrofitted Social Housing	total area / cate	^B ASSOCIAted	with docun	n ent Ref. <i>A</i>78 9	2016)5910251	- 13/10/2016
1.2	Local Climate Climatic Zone (national definition)		Oceanic (Köppen climate classification)	January average out August average outs Average global horiz Annual heating degre	side temperature ide temperature contal radiation ee days [3]	°C °C kWh/m² yr °Cd/yr	3 15 860 2741		
1.3	Maximum requireme Façade/wall Roof Ground floor Glazing Average U-value Glazing Shading Ventilation rate [4]	U U U U U g Fs	Iding fabric W / m2K W / m2K W / m2K W / m2K W / m2K total solar energy transmittance of glazing [%] Shading correction factor air changes/hr	New or existing building [5] 0.27 0.18 0.2 1.8 0.3 7 7 7	National regulation for new built [6] 0.25 0.18 0.29 1.8 0.29 7 1 1 7	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7] 0.27 0.18 0.2 1.8 0.3 7 7 7	Reduction %	
2	Building Energy Per	formance							
2.1 energy carrier existing building	Energy demand per suggested energy carrier	m2 of tota	I used conditioned floor area (kWh / m2yr) inc specify energy efficiency measures	I. system losses New or existing building [5]	National regulation for new built [6]	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Additional energy savings	
Heating + ven	tilation District Heating - Gas- fired CHP kV	Vh/m²yr	Smart meters, smart controls	71.03311913			71.03311913	0%	
Cooling + ven	tilation kV	Vh/m²vr				<u> </u>		0%	
Ventilation (if	separate from heating/	cooling)							
Lighting	kV	Vh/m ² yr						0%	
	electricity kV	Vh/m²yr						0%	
Domestic Hot	Water (DHW) District Heating - Gas- fired CHP kV demand	Vh/m ² yr	Smart meters, smart controls	37.2219476			37.2219476	0%	
	KV	vn/m yr						0%	
		Vh/m ⁻ yr	Subtotal sum of energy demand	108.2550667	0	0	108.2550667	0%	
	Appliances (please i	ndicate, but Vh/m ² yr	costs are not eligible) Demand-side management in some properties, but no overally energy savings assumed - load shifting.	60			60	0%	
total production kWh/yr	m ² installed in	V stalled Wh/m ² yr	specify RES measures Subtotal sum of RES contribution	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	RES increased contribution [%] 0% 0% 0% 0% 0%	
3	Building Energy Usa kV kV	e Vh/m²yr Vh/m²yr Vh/m²yr	per m ² of total conditioned/heated floor area (kW Subtotal sum of energy demand Subtotal sum of RES contribution Total Building Net Energy Use	New or existing building [5] 108.2550667 0 108.2550667	National regulation for new built [6] 0 0	National regulation for refurbished buildings or normal practice (6a) 0 0	suggested specification [7] 108.2550667 0 108.2550667	improvement from regulation for refurbished/normal practice 0.00 0.00	
4	Other national overa	all energy p	performance targets or criteria (additional inforr	nation, mandatory if ex	isting)	National regulation for refurbished			

Ur	nits [8] e	explain content and scale [9]	New or existing building [5]	National regulation for new built	buildings or normal practice	suggested specification

Building	Energy Speci	fication	Table (BEST)	Community / site	Drygate - CN9D	BEST no	D.		
(10 be complete 1.1	Building Category	/ [1 description	residential retrofitted Social Housing	total area / cate	^{BASSOCIAted}	with docun	n <mark>ent Ref. <i>&</i>#4</mark> 8	g ² (2016)5910251	- 13/10/2016
1.2	Local Climate			January average out	side temperature	°C	3		
	Climatic Zone		Oceanic	August average outs Average global horiz	ide temperature contal radiation	°C kWh/m² yr	15 860		
	(national definition)		(Köppen climate classification)	Annual heating degree	ee days [3]	°Cd/yr	2741		
				New or existing	National regulation for new	National regulation for refurbished buildings or normal	suggested		
1.3	Maximum require	ments of bu	ilding fabric	building [5]	built [6]	practice (6a)	specification [7]	Reduction %	
	Façade/wall Roof	UU	W / m2K W / m2K	0.27	0.25		0.27	0% 0%	
	Ground floor Glazing	U Ug	W / m2K W / m2K	0.2	0.2		0.2	0%	
	Average U-value Glazing	U _{av} g	W / m2K total solar energy transmittance of glazing [%]	0.3	0.29		0.3	0%	
	Shading Ventilation rate [4]	Fs	Shading correction factor air changes/hr	/	/		/	0% 0%	
2	Building Eporgy	orformanao							
21	Energy demand p	er m2 of tot	al used conditioned floor area (kWh / m2vr) inc	l system losses					
2.1	Energy demand p			a system losses		National regulation for			
energy carrier existing building	suggested energy carrier		specify energy efficiency measures	New or existing building [5]	National regulation for new built [6]	refurbished buildings or normal practice (6a)	suggested specification [7]	Additional energy savings	
Heating + ven	tilation								
Electricity	District Heating - Gas- fired CHP	kWh/m²yr	Smart meters, smart controls	71.03311913			71.03311913	0%	
Cooling + ven	tilation	1/10/lb/mm ² / m		·	·	·	·		
Ventilation (if	separate from heatin							0%	
Ventilation (ii		kWh/m ² yr						0%	
Lighting									
Demonstra Had	electricity	kWh/m²yr						0%	
Domestic Hot									
Fleetsieity	District Heating - Gas- fired CHP	k/M/b/m ² /r	Cmost motore, amost controle	27 2240476			27 2240476		
Other energy	demand	Kvvii/iii yi	Smart meters, smart controls	37.2219470			37.2219470	0%	
		kWh/m²yr						0%	
		kWh/m ² yr	Subtotal sum of energy demand	108.2550667	0	0	108.2550667	0%	
	•		4 4 - 11-11-1-)						
	Appliances (pleas	e indicate, bl	t costs are not eligible) Demand-side management in some						
	electricity	kWh/m²yr	properties, but no overally energy savings assumed - load shifting.	60			60	0%	
2.2	RES contribution	per m2 of to	tal used conditioned area (kWh / m2 yr)						
						regulation for refurbished			
total production		kW		New or existing	National regulation for new	buildings or normal	suggested	RES increased	
KWN/yr	minstalled	Installed	specify RES measures	building [5]	Dulit (6)	practice (6a)	specification [7]	Contribution [%]	
								0%	
								0%	
		kWh/m²yr	Subtotal sum of RES contribution	0	0	0	0	0%	
3	Building Energy L	Jse	per m ² of total conditioned/heated floor area (kW	h/m2 yr)		National			
				New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested	improvement from regulation for refurbished/normal practice	
		kWh/m ² yr kWh/m ² yr	Subtotal sum of energy demand	108.2550667	0	0	108.2550667	0.00	
		kWh/m ² vr	Total Building Net Energy Lise	108 2550667	0	0	100 2550667	0.00	
		yı	Total Dulining Met Ellelyy Use	100.200067	0	U	108.2550667	0.00	
4	Other national ov	erall energy	performance targets or criteria (additional inforr	nation, mandatory if ex	isting)				
						National regulation for refurbished			

Ur	nits [8] e	explain content and scale [9]	New or existing building [5]	National regulation for new built	buildings or normal practice	suggested specification

Building	Energy Spec	ification	Table (BEST)	Community /	site	Drygate - CN10A	BEST no	D.		
(to be completed)	ed for every diffrent Building Categor	type/category y [1	/ of proposed building) residential retrofitted	total area / ca	ate	BASSOCIAted	with docur	nent Ref. 1432	ຮູ້(2016)5910251	- 13/10/2016
		description	Social Housing				°0	1 1	· · · ·	
1.2	Local Climate			January aver August avera	age ou age out	itside temperature side temperature	°C	3 15		
	Climatic Zone (national definition)	Oceanic (Köppen climate classification)	Average glob Annual heatir	oal hori ng degi	zontal radiation ree days [3]	kWh/m² yr °Cd/yr	860 2741		
							National regulation for			
				New or existing		National regulation for new	buildings or normal	suggested		
1.3	Maximum require	ements of bu	ilding fabric	building [5]		built [6]	practice (6a)	specification [7]	Reduction %	
	Façade/wall Roof	U U	W / m2K W / m2K	0.	27 18	0.25		0.27 0.18	0% 0%	
	Ground floor Glazing	U Ug	W / m2K W / m2K	1).2 1.8	0.2		0.2	0%	
	Average U-value	U _{av}	W / m2K	(0.3	0.29		0.3	0%	
	Shading Ventilation rate [4]	9 Fs	Shading correction factor air changes/hr		/	1		1	0%	
					,				0,0	
2	Building Energy	Performance	2							
2.1	Energy demand p	per m2 of tot	al used conditioned floor area (kWh / m2yr) in	cl. system loss	es		National			
energy	sunnested			New or		National	regulation for refurbished buildings or			
existing	energy carrier		specify energy efficiency measures	existing building [5]		regulation for new built [6]	normal practice (6a)	suggested specification [7]	Additional energy savings	
Heating + ven	tilation			511			1 (7)			
	District				٦					
Electricity	Heating - Gas- fired CHP	kWh/m²yr	Smart meters, smart controls	53.610848	31			53.61084831	0%	
Cooling + ven	tilation									
		kWh/m²yr							0%	
Ventilation (if	separate from heati	ng/cooling)			_					
		kWh/m²yr							0%	
Lighting	electricity	kWh/m²yr							0%	
Domestic Hot	Water (DHW)									
	District									
Electricity	Heating - Gas- fired CHP	kWh/m²yr	Smart meters, smart controls	29.421039	94			29.42103994	0%	
Other energy	demand									
		kWh/m ² yr							0%	
		kWh/m ² yr	Subtotal sum of energy demand	83.031888	25	0	0	83.03188825	0%	
	Appliances (pleas	se indicate bi	It costs are not eligible)							
			Demand-side management in some		٦					
	electricity	kWh/m²yr	properties, but no overally energy savings assumed - load shifting.		55			55	0%	
2.2	RES contribution	per m2 of to	otal used conditioned area (kWh / m2 yr)							
total				Now or		National	regulation for refurbished			
production kWh/vr	m ² installed	kW installed	specify RES measures	existing building [5]		regulation for new	normal practice (6a)	suggested	RES increased	
				<u>3 [4]</u>					0%	
									0%	
									0%	
		kWh/m²yr	Subtotal sum of RES contribution		0	0	0	0	0%	
3	Building Energy	Use	per m ² of total conditioned/heated floor area (kW	/h/m2 yr)						
							National regulation for refurbished		improvement from	
				New or existing		National regulation for new	buildings or normal practice	suggested	regulation for refurbished/normal	
		kWh/m²yr	Subtotal sum of energy demand	building [5] 83.031888	25	built [6]	(6a) 0	specification [7] 83.03188825	practice 0.00	
		kWh/m ² yr	Subtotal sum of RES contribution		0	0	0	0	0.00	
		kWh/m ² yr	Total Building Net Energy Use	83.031888	25	0	0	83.03188825	0.00	
4	Other national ov	verall energy	performance targets or criteria (additional infor	mation, mandat	ory if e	xisting)	National			
							regulation for			

Units [8]	explain content and scale [9]	New or existing building [5]	National regulation for new built	buildings or normal practice	suggested specification

Building I	Energy Spec	ification	Table (BEST)	Community / site	Drygate - CN10B	BEST no	o.		
(to be complete 1.1	Building Categor	y [1]	residential retrofitted	total area / categ	BASSOCIEIted	with docur	nent Ref. Ast	ຮໍ້(2016)5910251	- 13/10/2016
12	Local Climate	description	oolia hodoing	January average	outside temperature	°C	3		
1.2	Climatia Zana		Ossenia	August average of	outside temperature	°C	15		
	(national definition))	(Köppen climate classification)	Average global h Annual heating de	egree days [3]	°Cd/yr	2741		
						National			
						regulation for refurbished			
1.2	Maximum require	monto of hu	ilding fabria	New or existing building [5]	National regulation for new	buildings or normal practice (6a)	suggested	Reduction %	
1.5	Facade/wall	U	W / m2K	0.27	0.25	practice (ba)	0.27	0%	
	Roof Ground floor	U U	W / m2K W / m2K	0.18	0.18		0.18	0%	
	Glazing	Ug Um	W / m2K	1.8	1.8		1.8	0%	
	Glazing	g Eo	total solar energy transmittance of glazing [%]	/	/		/	0%	
	Ventilation rate [4]	F8	air changes/hr	/			/	0%	
2	Building Energy I	Performance							
2.1	Energy demand p	per m2 of tota	al used conditioned floor area (kWh / m2yr) inc	d. system losses					
energy						National regulation for refurbished			
carrier existing	suggested energy			New or existing	National regulation for new	buildings or normal	suggested	Additional energy	
building	carrier		specify energy efficiency measures	building [5]	built [6]	practice (6a)	specification [7]	savings	
Heating + ven	tilation								
Els staisits	District Heating - Gas-	WM/h /ma ² , ar		50.040045			50.040045	0%	
Cooling + ven	tilation	KVVII/III yi	Smart meters, smart controls	53.318645			53.318645	0%	
		kWh/m²yr						0%	
Ventilation (if	separate from heati	ng/cooling)							
		kWh/m²yr						0%	
Lighting	electricity	kWh/m²vr						0%	
Domestic Hot	Water (DHW)	,							
	District								
Electricity	Heating - Gas- fired CHP	kWh/m²yr	Smart meters, smart controls	29.1196181			29.1196181	0%	
Other energy	demand								
		kWh/m ² yr						0%	
		kWh/m²yr	Subtotal sum of energy demand	82.4382631	0	0	82.4382631	0%	
	Appliances (pleas	e indicate, bu	t costs are not eligible)						
		,	Demand-side management in some						
	electricity	kWh/m²yr	assumed - load shifting.	55			55	0%	
2.2	RES contribution	per m2 of to	tal used conditioned area (kWh / m2 yr)			regulation for			
total				New or	National	refurbished buildings or			
production kWh/yr	m ² installed	kW installed	specify RES measures	existing building [5]	regulation for new built [6]	normal practice (6a)	suggested specification [7]	RES increased contribution [%]	
								0% 0%	
								0%	
		kW/b/m ² vr	Subtatal aum of RES contribution					0%	
		Kvviviii yi	Subtotal sum of RES contribution	0	0	0	0	078	
3	Building Energy	Jse	$\ensuremath{per}\xspace$ m $\ensuremath{m}\xspace^2$ of total conditioned/heated floor area (kW	'h/m2 yr)		National			
				New or	National	regulation for refurbished buildings or		improvement from regulation for	
				existing building [5]	regulation for new built [6]	normal practice (6a)	suggested specification [7]	refurbished/normal practice	
		kWh/m²yr kWh/m²yr	Subtotal sum of energy demand Subtotal sum of RES contribution	82.4382631	0	0	82.4382631	0.00	
		kWh/m²yr	Total Building Net Energy Use	82.4382631	0	0	82.4382631	0.00	
4	Other national ov	erall energy	performance targets or criteria (additional inform	mation, mandatory i	f existing)				
						National regulation for			

New or National buildings or existing regulation for new normal suggested Units [8] explain content and scale [9] building [5] built practice specification

Building	Energy Specific	ation	Table (BEST)	Community / site	Drygate - CN10C	BEST no	D.		
(to be complete 1.1	Building Category des	[1] scription	residential retrofitted Social Housing	total area / cate	^B ASSOCIAted	with docun	n <mark>ent Ref. 499</mark> 9	2016)5910251	- 13/10/2016
1.2	Local Climate Climatic Zone (national definition)		Oceanic (Köppen climate classification)	January average out August average outs Average global horiz Annual heating degre	side temperature ide temperature contal radiation ee days [3]	°C °C kWh/m² yr °Cd/yr	3 15 860 2741		
1.3	Maximum requirement Façade/wall Roof Ground floor Glazing Average U-value Glazing Shading Ventilation rate [4]	nts of bui U U U U g Fs	ding fabric W / m2K W / m2K W / m2K W / m2K W / m2K total solar energy transmittance of glazing [%] Shading correction factor air changes/hr	New or existing building [5] 0.27 0.18 0.2 1.8 0.3 7 7 7 7	National regulation for new built [6] 0.25 0.18 0.29 1.8 0.29 7 1 1 7	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7] 0.27 0.18 0.2 1.8 0.3 7 7 7	Reduction %	
2	Building Energy Perf	ormance							
2.1 energy carrier existing building	Energy demand per r suggested energy carrier	n2 of tota	I used conditioned floor area (kWh / m2yr) inc specify energy efficiency measures	I. system losses New or existing building [5]	National regulation for new built [6]	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Additional energy savings	
Heating + ven	tilation District Heating - Gas- fired CHP kW	'h/m²yr	Smart meters, smart controls	71.03311913			71.03311913	0%	
Cooling + ven	tilation kW	'h/m²yr						0%	
Ventilation (if	separate from heating/c	ooling) 'h/m ² yr						0%	
Lighting	electricity kW	'h/m²yr						0%	
Domestic Hot	Water (DHW) District Heating - Gas- fired CHP kW demand	'h/m ² yr	Smart meters, smart controis	37.2219476			37.2219476	0%	
	kw	'h/m ⁻ yr 'h/m ² yr	Subtotal sum of energy demand	108,2550667	0	0	108,2550667	0%	
	Appliances (please in	dicate but	costs are not elizible)						
	electricity kW	'h/m ² yr	Demand-side management in some properties, but no overally energy savings assumed - load shifting.	60			60	0%	
total production kWh/yr	m ² installed inst kW	talled	specify RES measures Subtotal sum of RES contribution	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	RES increased contribution [%] 0% 0% 0% 0% 0% 0% 0%	
3	Building Energy Use kW kW	'h/m²yr 'h/m²yr 'h/m²yr	per m ² of total conditioned/heated floor area (kW Subtotal sum of energy demand Subtotal sum of RES contribution Total Building Net Energy Use	New or existing building [5] 108.2550667 0 108.2550667	National regulation for new built [6] 0	National regulation for refurbished buildings or normal practice (6a) 0 0	suggested specification [7] 108.2550667 0 108.2550667	improvement from regulation for refurbished/normal practice 0.00 0.00	
4	Other national overal	ll energy p	performance targets or criteria (additional inform	nation, mandatory if ex	isting)	National regulation for refurbished			

Ur	nits [8] e	explain content and scale [9]	New or existing building [5]	National regulation for new built	buildings or normal practice	suggested specification

Building	Energy Spec	ification	Table (BEST)	Community / site	Drygate - CN11A	BEST no).		
(to be complete 1.1	Building Catego	ry [1] description	of proposed building) residential retrofitted Social Housing	total area / cate	PASSociated	with docun	n <mark>ent Ref. 499</mark>	ຮໍ້(2016)5910251	- 13/10/2016
1.2	Local Climate Climatic Zone (national definition))	Oceanic (Köppen climate classification)	January average out August average outs Average global horiz Annual heating degr	tside temperature side temperature zontal radiation ree days [3]	°C °C kWh/m² yr °Cd/yr	3 15 860 2741		
1.3	Maximum require Façade/wall Roof Ground floor Glazing Average U-value Glazing Shading Ventilation rate [4]	ements of bu U U U U _g U _{av} 9 Fs	Iding fabric W / m2K W / m2K W / m2K W / m2K W / m2K total solar energy transmittance of glazing [%] Shading correction factor air changes/hr	New or existing building [5] 0.27 0.18 0.2 1.8 0.3 7 7 7 7 7	National regulation for new built [6] 0.25 0.18 0.29 1.8 0.29 7 7 7 7	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7] 0.27 0.18 0.2 1.8 0.3 7 7 7	Reduction % 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%	
2	Building Energy	Performance							
2.1	Energy demand	per m2 of tota	I used conditioned floor area (kWh / m2yr) inc	l. system losses		National			
energy carrier existing building	suggested energy carrier		specify energy efficiency measures	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Additional energy savings	
Electricity	District Heating - Gas- fired CHP	kWh/m ² yr	Smart meters, smart controls	96.18730809			96.18730809	0%	
Cooling + ven	tilation	kWh/m²yr						0%	
Ventilation (if	separate from heat	ing/cooling)							
		kWh/m²yr						0%	
Lighting									
Domestic Hot	electricity Water (DHW)	kWh/m ² yr						0%	
Electricity Other energy	District Heating - Gas- fired CHP demand	kWh/m²yr	Smart meters, smart controls	38.1013306			38.1013306	0%	
		kWh/m ² yr						0%	
		kWh/m²yr	Subtotal sum of energy demand	134.2886387	0	0	134.2886387	0%	
	Appliances (plea	se indicate, bu	t costs are not eligible)						
	electricity	kWh/m²yr	Demand-side management in some properties, but no overally energy savings assumed - load shifting.	60			60	0%	
2.2	RES contribution	n per m2 of to	tal used conditioned area (kWh / m2 yr)						
total production kWh/yr	m ² installed	kW installed kWh/m ² yr	specify RES measures	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	RES increased contribution [%] 0% 0% 0% 0%	
~	Puilding From	llee	ner m ² of total conditioned/hosted fleer are - (1)M	'h/m2 \/r)					
3	Building Energy	use kWh/m²yr kWh/m²yr kWh/m²yr	Per III or total conditioned/heated floor area (kW Subtotal sum of energy demand Subtotal sum of RES contribution Total Building Net Energy Use	New or existing building [5] 134.2886387 0 134.2886387	National regulation for new built [6] 0 0	National regulation for refurbished buildings or normal practice (6a) 0 0	suggested specification [7] 134.2886387 0 134.2886387	improvement from regulation for refurbished/normal practice 0.00 0.00	
4	Other national or	verall energy	performance targets or criteria (additional inform	nation, mandatory if ex	xisting)	National regulation for refurbished			

Ur	nits [8] e	explain content and scale [9]	New or existing building [5]	National regulation for new built	buildings or normal practice	suggested specification

Building	Energy Spec	ification	Table (BEST)	Community / site	Drygate - CN11B	BEST n	0.		
(to be complete 1.1	Building Catego	y [' description	residential retrofitted	total area / cate	● ^B RSSociated	with docur	n ent Ref. 46 8	ຮໍ(2016)5910251	- 13/10/2016
1.2	Local Climate			January average of	outside temperature	°C	3		
	Climatic Zone		Oceanic	August average o Average global ho	utside temperature prizontal radiation	°C kWh/m² yr	15 860		
	(national definition	1)	(Köppen climate classification)	Annual heating de	egree days [3]	°Cd/yr	2741		
						National			
				Now or	National	regulation for refurbished			
1.3	Maximum require	ements of bu	ilding fabric	existing building [5]	regulation for new built [6]	normal practice (6a)	suggested specification [7]	Reduction %	
	Façade/wall	U	W / m2K	0.27	0.25		0.27	0%	
	Roof Ground floor	UU	W / m2K W / m2K	0.18	0.18		0.18	0% 0%	
	Glazing Average U-value	U _g U _{av}	W / m2K W / m2K	1.8 0.3	1.8 0.29		1.8 0.3	0%	
	Glazing	g Es	total solar energy transmittance of glazing [%] Shading correction factor	/	/		1	0%	
	Ventilation rate [4]		air changes/hr	/	/		/	0%	
2	Building Energy	Performance)						
2.1	Energy demand	per m2 of tot	al used conditioned floor area (kWh / m2yr) in	cl. system losses		N1-411			
energy						regulation for refurbished			
carrier existing	suggested energy			New or existing	National regulation for new	buildings or normal	suggested	Additional energy	
building	carrier		specify energy efficiency measures	building [5]	built [6]	practice (6a)	specification [7]	savings	
Heating + ven	tilation								
	District Heating - Gas-								
Electricity	tilation	kWh/m*yr	Smart meters, smart controls	96.21192731			96.21192731	0%	
		kWh/m²yr						0%	
Ventilation (if	separate from heat	ing/cooling)							
		kWh/m²yr						0%	
Lighting	. .	1/10/1b/mm ² 2.07	·			1			
Domestic Hot	electricity	KVVII/III YI						0%	
	District								
Electricity	District Heating - Gas- fired CHP	kWh/m ² vr	Smart meters, smart controls	38 11108267			38 11108267	0%	
Other energy	demand	, .		00.11100201		. <u> </u>	00.11100201	0.0	
		kWh/m²yr						0%	
		kWh/m ² vr	Subtotal sum of energy demand	134 32301		0	134 32301	0%	
			outour our of chorgy domaina	104.02001			104.02001	078	
	Appliances (plea	se indicate, b	ut costs are not eligible) Demand-side management in some					[]	
	electricity	kWh/m²yr	properties, but no overally energy savings assumed - load shifting.	60			60	0%	
2.2	RES contribution	n per m2 of t	otal used conditioned area (kWh / m2 yr)						
						regulation for refurbished			
total production	2	kW		New or existing	National regulation for new	buildings or normal	suggested	RES increased	
kWh/yr	m ² installed	installed	specify RES measures	building [5]	built [6]	practice (6a)	specification [7]	contribution [%]	
								0% 0%	
								0% 0%	
		kWh/m²yr	Subtotal sum of RES contribution	0	0	0	0	0%	
2	Building Energy	1150	per m ² of total conditioned/heated floor area (///	Vh/m2 vr)					
3	Surrang Energy	030	por mon or total containonoumented from a Ba (KV			National regulation for		improvement form	
				New or existina	National regulation for new	refurbished buildings or normal practice	suagested	regulation for refurbished/normal	
		kWh/m ² vr	Subtotal sum of energy demand	building [5]	built [6]	(6a)	specification [7]	practice	
		kWh/m ² yr	Subtotal sum of RES contribution	0	0	0	0	0.00	
		kWh/m²yr	Total Building Net Energy Use	134.32301	0	0	134.32301	0.00	
4	Other national ov	verall energy	performance targets or criteria (additional info	rmation, mandatory if	existing)	National			
						regulation for			

ī	Units [8]	explain content and scale [9]	New or existing building [5]	National regulation for new built	buildings or normal practice	suggested specification

Building	Energy Specif	fication	Table (BEST)	Community / site	Drygate - CN11C	BEST no	D.		
(to be completed) 1.1	Building Category	description	residential retrofitted Social Housing	total area / cate	^B ASSOCIAted	with docur	n <mark>ent Ref. 1478</mark> 8	g(2016)5910251	- 13/10/2016
1.2	Local Climate			January average out	tside temperature	°C	3		
	Climatic Zone		Oceanic	August average outs Average global horiz	side temperature zontal radiation	°C kWh/m² yr	15 860		
	(national definition)		(Köppen climate classification)	Annual heating degr	ee days [3]	°Cd/yr	2741		
						National regulation for			
				New or	National	refurbished buildings or			
1.3	Maximum requiren	nents of bu	ilding fabric	existing building [5]	regulation for new built [6]	normal practice (6a)	suggested specification [7]	Reduction %	
	Façade/wall	U	W / m2K	0.27	0.25		0.27	0%	
	Ground floor	U	W / m2K W / m2K	0.18	0.18		0.18	0%	
	Giazing Average U-value	U _g U _{av}	W / m2K	0.3	0.29		0.3	0%	
	Glazing Shading	g Fs	total solar energy transmittance of glazing [%] Shading correction factor	/	/		/	0% 0%	
	Ventilation rate [4]		air changes/hr	/	/		/	0%	
2	Building Energy P	erformance							
2.1	Energy demand pe	er m2 of tota	al used conditioned floor area (kWh / m2yr) inc	I. system losses		National			
energy	suggested			Now or	National	regulation for refurbished			
existing	energy carrier		specify energy efficiency measures	existing building [5]	regulation for new built [6]	normal practice (6a)	suggested specification [7]	Additional energy savings	
Heating + ven	tilation			511	L · J				
	District								
Electricity	Heating - Gas- fired CHP	kWh/m²yr	Smart meters, smart controls	69.40077466			69.40077466	0%	
Cooling + ven	tilation			_	_	_	_		
		kWh/m²yr						0%	
Ventilation (if	separate from heating	g/cooling) kWh/m ² vr						0%	
Lighting	· ·				L			078	
	electricity	kWh/m²yr						0%	
Domestic Hot	Water (DHW)								
	District Heating - Gas-								
Electricity	fired CHP	kWh/m²yr	Smart meters, smart controls	24.39431913			24.39431913	0%	
Other energy	demand	/M/b/m ² /r			[]			0%	
	'	xvvii/iii yi						0%	
		kWh/m²yr	Subtotal sum of energy demand	93.7950938	0	0	93.7950938	0%	
	Appliances (please	indicate, bu	t costs are not eligible)						
			Demand-side management in some properties, but no overally energy savings						
	electricity	kWh/m²yr	assumed - load shifting.	50			50	0%	
2.2	RES contribution p	per m2 of to	tai used conditioned area (kwn / mz yr)			regulation for			
total		201		New or	National	refurbished buildings or	oursected	DES increased	
kWh/yr	m ² installed i	installed	specify RES measures	building [5]	built [6]	practice (6a)	specification [7]	contribution [%]	
								0%	
								0%	
		kWh/m²yr	Subtotal sum of RES contribution	0	0	0	0	0%	
			2						
3	Building Energy U	se	per m ⁻ of total conditioned/heated floor area (kW	n/m2 yr)		National regulation for			
				New or	National	refurbished buildings or	ourrest	Improvement from regulation for	
		kWh/m ² vr	Subtotal sum of energy demand	building [5]	built [6]	(6a)	specification [7]	practice	
	,	kWh/m ² yr	Subtotal sum of RES contribution	0	0	0	0	0.00	
	ł	kWh/m²yr	Total Building Net Energy Use	93.7950938	0	0	93.7950938	0.00	
4	Other national ove	rall energy	performance targets or criteria (additional inform	nation, mandatory if ex	kisting)	National			
						regulation for refurbished			

Units [8] explain content and scale [9]	New or existing building [5]	National regulation for new built	buildings or normal practice	suggested specification]
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Building	Energy Spec	ification	Table (BEST)	Community / site	Drygate - CN11D	BEST no	D.		
(to be complete 1.1	Building Categor	ry [1] description	of proposed building) residential retrofitted Social Housing	total area / cate	PASSociated	with docun	n <mark>ent Ref. 1499</mark> 8	g ² (2016)5910251	- 13/10/2016
1.2	Local Climate Climatic Zone (national definition))	Oceanic (Köppen climate classification)	January average ou August average out Average global hori: Annual heating degr	tside temperature side temperature zontal radiation ree days [3]	°C °C kWh/m² yr °Cd/yr	3 15 860 2741		
1.3	Maximum require Façade/wall Roof Ground floor Glazing Average U-value Glazing Shading Ventilation rate [4]	ements of bu U U U U _g U _{av} Fs	Iding fabric W / m2K W / m2K W / m2K W / m2K W / m2K total solar energy transmittance of glazing [%] Shading correction factor air changes/hr	New or existing building [5] 0.27 0.18 0.2 1.8 0.3 7 1 1.8 0.3	National regulation for new built [6] 0.25 0.18 0.29 1.8 0.29 7 7 7 7	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7] 0.27 0.18 0.2 1.8 0.3 7 7 7	Reduction % 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%	
2	Building Energy	Performance							
2.1	Energy demand	per m2 of tota	al used conditioned floor area (kWh / m2yr) inc	:l. system losses		National			
energy carrier existing building	suggested energy carrier		specify energy efficiency measures	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Additional energy savings	
Electricity	District Heating - Gas- fired CHP	kWh/m²yr	Smart meters, smart controls	71.03311913			71.03311913	0%	
Cooling + ven	tilation	kWh/m ² vr]			·	·	0%	
Ventilation (if	separate from heati	ing/cooling)		J				0,0	
		kWh/m ² yr						0%	
Lighting									
Domestic Hot	electricity Water (DHW)	kWh/m ² yr						0%	
Electricity Other energy	District Heating - Gas- fired CHP demand	kWh/m²yr	Smart meters, smart controls	37.2219476			37.2219476	0%	
		kWh/m ² yr						0%	
		kWh/m²yr	Subtotal sum of energy demand	108.2550667	0	0	108.2550667	0%	
	Appliances (pleas	se indicate, bu	t costs are not eligible)						
	electricity	kWh/m²yr	Demand-side management in some properties, but no overally energy savings assumed - load shifting.	60			60	0%	
2.2 total production kWh/yr	RES contribution	n per m2 of to kW installed	tal used conditioned area (kWh / m2 yr) specify RES measures	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	RES increased contribution [%]	
								0%	
								0%	
<u> </u>	LI	kW/b/m ² vr	Subtotal our of PES contribution					0%	
2	Puilding Energy	llee	per m^2 of total conditioned/heated floor area (////	(m2.)rr)	0	0	0	078	
3	Building Energy	kWh/m ² yr kWh/m ² yr kWh/m ² yr	Subtotal sum of energy demand Subtotal sum of energy demand Subtotal sum of RES contribution	New or existing building [5] 108.2550667 0 108.2550667	National regulation for new built [6] 0	National regulation for refurbished buildings or normal practice (6a) 0 0	suggested specification [7] 108.2550667 0 108.2550667	improvement from regulation for practice 0.00 0.00 0.00	
4	Other national ov	verall energy	performance targets or criteria (additional inform	nation, mandatory if ex	xisting)	National regulation for refurbished			

Ur	nits [8] e	explain content and scale [9]	New or existing building [5]	National regulation for new built	buildings or normal practice	suggested specification

Building	Energy Spec	ification	Table (BEST)	Community / site	Drygate - MSCN1	BEST no).		
(to be complete 1.1	ed for every diffrent Building Catego	ry [1] description	of proposed building) residential retrofitted Social Housing	total area / cate	PASSociated	with docun	n <mark>ent Ref. 34378</mark> 8	g ² (2016)5910251	- 13/10/2016
1.2	Local Climate Climatic Zone (national definition))	Oceanic (Köppen climate classification)	January average ou August average out Average global horiz Annual heating degr	tside temperature side temperature zontal radiation ree days [3]	°C °C kWh/m² yr °Cd/yr	3 15 860 2741		
1.3	Maximum requin Façade/wall Roof Ground floor Glazing Average U-value Glazing Shading Ventilation rate [4]	ements of bu U U U U _g U _{av} 9 Fs	Iding fabric W / m2K W / m2K W / m2K W / m2K W / m2K total solar energy transmittance of glazing [%] Shading correction factor air changes/hr	New or existing building [5] 0.27 0.18 0.2 1.8 0.3 7 7 7 7	National regulation for new built [6] 0.25 0.18 0.29 1.8 0.29 7 7 7 7	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7] 0.27 0.18 0.2 1.8 0.3 7 7 7	Reduction % 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%	
2	Building Energy	Performance							
2.1	Energy demand	per m2 of tota	I used conditioned floor area (kWh / m2yr) inc	:l. system losses		National			
energy carrier existing building	suggested energy carrier		specify energy efficiency measures	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Additional energy savings	
Electricity	District Heating - Gas- fired CHP	kWh/m²yr	Smart meters, smart controls	47.17948718			47.17948718	0%	
Cooling + ven	itilation	kWh/m ² vr				·	·	0%	
Ventilation (if	separate from heat	ing/cooling)						0,0	
		kWh/m ² yr						0%	
Lighting									
Domestic Hot	electricity Water (DHW)	kWh/m ² yr						0%	
Electricity Other energy	District Heating - Gas- fired CHP demand	kWh/m²yr	Smart meters, smart controls	29.04761905			29.04761905	0%	
		kWh/m ² yr						0%	
		kWh/m²yr	Subtotal sum of energy demand	76.22710623	0	0	76.22710623	0%	
	Appliances (plea	se indicate, bu	t costs are not eligible)						
	electricity	kWh/m²yr	Demand-side management in some properties, but no overally energy savings assumed - load shifting.	55			55	0%	
2.2 total production kWh/yr	RES contribution	kW installed kWh/m ² yr	tal used conditioned area (kWh / m2 yr) specify RES measures Subtotal sum of RES contribution	New or existing building (5)	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	RES increased contribution [%] 0% 0% 0%	
3	Building Energy	Use kWh/m ² yr kWh/m ² yr kWh/m ² yr	per m ⁻ of total conditioned/heated floor area (kW Subtotal sum of energy demand Subtotal sum of RES contribution Total Building Net Energy Use	h/m2 yr) New or existing building [5] 76.22710623 0 76.22710623	National regulation for new built [6] 0 0	National regulation for refurbished buildings or normal practice (6a) 0 0	suggested specification [7] 76.22710623 0 76.22710623	improvement from regulation for refurbished/normal practice 0.00 0.00	
4	Other national ov	verall energy	performance targets or criteria (additional inform	nation, mandatory if ex	xisting)	National regulation for refurbished			

Ur	nits [8] e	explain content and scale [9]	New or existing building [5]	National regulation for new built	buildings or normal practice	suggested specification

Building	Energy Spec	ification	Table (BEST)	Community / site	Drygate - MSCN2	BEST no	D.		
(to be complete 1.1	ed for every diffrent Building Catego	ry [1 description	of proposed building) residential retrofitted Social Housing	total area / cate	**************************************	with docur	n ent Ref. 4%}d §	ຮໍ້(2016)5910251	- 13/10/2016
1.2	Local Climate Climatic Zone (national definition	1)	Oceanic (Köppen climate classification)	January average ou August average ou Average global hor Annual heating deg	utside temperature tside temperature izontal radiation ree days [3]	°C °C kWh/m² yr °Cd/yr	3 15 860 2741		
1.3	Maximum requin Façade/wall Roof Ground floor Glazing Average U-value Glazing Shading Ventilation rate [4	ements of bu U U U _a Fs	ilding fabric W / m2K W / m2K W / m2K W / m2K W / m2K total solar energy transmittance of glazing [%] Shading correction factor air changes/hr	New or existing building [5] 0.27 0.18 0.2 1.8 0.3 7 7 7 7 7	National regulation for new built [6] 0.25 0.18 0.29 1.8 0.29 7 7 7 7	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7] 0.27 0.18 0.2 1.8 0.3 7 7 7	Reduction % 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%	
2	Building Energy	Performance							
2.1	Energy demand	per m2 of tot	al used conditioned floor area (kWh / m2yr) ind	cl. system losses		National			
energy carrier existing building	suggested energy carrier		specify energy efficiency measures	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Additional energy savings	
Electricity	District Heating - Gas- fired CHP	kWh/m²yr	Smart meters, smart controls	47.24005135			47.24005135	0%	
Cooling + ven	tilation	kWh/m ² vr		·				0%	
Ventilation (if	separate from heat	ing/cooling)						0.0	
		kWh/m²yr						0%	
Lighting	electricity	kWh/m²yr						0%	
Electricity Other energy	District Heating - Gas- fired CHP demand	kWh/m ² yr	Smart meters, smart controls	29.08490739			29.08490739	0%	
		kWh/m²yr						0%	
		kWh/m²yr	Subtotal sum of energy demand	76.32495874	0	0	76.32495874	0%	
	Appliances (plea	se indicate, bu	ut costs are not eligible)						
	electricity	kWh/m²yr	Demand-side management in some properties, but no overally energy savings assumed - load shifting.	55			55	0%	
2.2 total production kWh/yr	m ² installed	kW installed kWh/m ² yr	specify RES measures Subtotal sum of RES contribution	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	RES increased contribution [%] 0% 0% 0% 0%	
3	Building Energy	Use kWh/m²yr kWh/m²yr kWh/m²yr	per m ² of total conditioned/heated floor area (kW Subtotal sum of energy demand Subtotal sum of RES contribution Total Building Net Energy Use	New or existing building [5] 76.32495874 0 76.32495874	National regulation for new built [6] 0 0	National regulation for refurbished buildings or normal practice (6a) 0 0	suggested specification [7] 76.32495874 0 76.32495874	improvement from regulation for refurbished/normal practice 0.00 0.00	
4	Other national of	verall energy	performance targets or criteria (additional infor	mation, mandatory if e	xisting)	National regulation for			

Units [8]	explain content and scale [9]	New or existing building [5]	National regulation for new built	buildings or normal practice	suggested

Building	Energy Spec	ification	Table (BEST)	Community / site	Drygate - MSCN3	BEST no	D.		
(to be complete 1.1	ed for every diffrent Building Catego	ry [1 description	residential retrofitted ▼ Social Housing	total area / cate	**************************************	with docur	n ent Ref. 498 5	ຮໍ້(2016)5910251	- 13/10/2016
1.2	Local Climate Climatic Zone (national definition	1)	Oceanic (Köppen climate classification)	January average o August average ou Average global ho Annual heating deg	utside temperature ttside temperature rizontal radiation gree days [3]	°C °C kWh/m² yr °Cd/yr	3 15 860 2741		
1.3	Maximum requir Façade/wall Roof Ground floor Glazing Average U-value Glazing Shading Ventilation rate [4]	ements of bu U U U U g Fs]	Ilding fabric W / m2K W / m2K W / m2K W / m2K W / m2K total solar energy transmittance of glazing [%] Shading correction factor air changes/hr	New or existing building [5] 0.27 0.18 0.2 1.8 0.3 7 7 7 7	National regulation for new built [6] 0.25 0.18 0.29 1.8 0.29 7 7 7 7	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7] 0.27 0.18 0.2 1.8 0.3 7 7 7	Reduction % 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%	
2	Building Energy	Performance	3						
2.1	Energy demand	per m2 of tot	al used conditioned floor area (kWh / m2yr) ind	cl. system losses		National			
energy carrier existing building	suggested energy carrier		specify energy efficiency measures	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Additional energy savings	
Electricity	District Heating - Gas- fired CHP	kWh/m²yr	Smart meters, smart controls	47.24005135			47.24005135	0%	
Cooling + ven	tilation	kWh/m ² vr				<u> </u>	<u> </u>	0%	
Ventilation (if	separate from heat	ing/cooling)						0.0	
		kWh/m²yr						0%	
Lighting	electricity	kWh/m ² yr						0%	
Electricity Other energy	District Heating - Gas- fired CHP demand	kWh/m ² yr	Smart meters, smart controls	29.08490739			29.08490739	0%	
		kWh/m ⁻ yr						0%	
		kWh/m²yr	Subtotal sum of energy demand	76.32495874	0	0	76.32495874	0%	
	Appliances (plea	se indicate, bi	ut costs are not eligible)						
	electricity	kWh/m²yr	Demand-side management in some properties, but no overally energy savings assumed - load shifting.	55			55	0%	
2.2 total production kWh/yr	m ² installed	kW installed kWh/m ² yr	specify RES measures Subtotal sum of RES contribution	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	RES increased contribution [%] 0% 0% 0% 0%	
3	Building Energy	Use KWh/m ² yr KWh/m ² yr KWh/m ² yr	per m ² of total conditioned/heated floor area (kW Subtotal sum of energy demand Subtotal sum of RES contribution Total Building Net Energy Use	New or existing building [5] 76.32495874 0 76.32495874	National regulation for new built [6] 0	National regulation for refurbished buildings or normal practice (6a) 0 0	suggested specification [7] 76.32495874 0 76.32495874	improvement from regulation for refurbished/normal practice 0.00 0.00	
4	Other national or	verall energy	performance targets or criteria (additional infor	mation, mandatory if e	existing)	National regulation for			

Un	its [8] explair	n content and scale [9]	New or existing building [5]	National regulation for new built	buildings or normal practice	suggested specification

Building I	Energy Specific	cation 1	Table (BEST)	Community / site	231 George St	BEST no	D.		
(to be completed)	Building Category de	scription	other Local Authority Office Building	total area / ca	Ƨිරිස්ස්ස් w	ith docume	nt Ref_Afest	016)5910251 -	13/10/2016
1.2	Local Climate			January average out	side temperature	°C	3		
	Climatic Zone		Oceanic	August average outs Average global horiz	side temperature contal radiation	°C kWh/m² yr	15 860		
	(national definition)		(Köppen climate classification)	Annual heating degr	ee days [3]	°Cd/yr	2741		
						National regulation for			
				New or	National	refurbished buildings or	suggested		
1.3	Maximum requireme	ents of bui	lding fabric	building [5]	built [6]	practice (6a)	specification [7]	Reduction %	
	Façade/wall Roof	U U	W / m2K W / m2K	1.5 0.13			1.5 0.13	0% 0%	
	Ground floor Glazing	U U _g	W / m2K W / m2K	0.13			0.13	0%	
	Average U-value Glazing	U _{av} g	W / m2K total solar energy transmittance of glazing [%]	- /			/	0%	
	Shading Ventilation rate [4]	Fs	Shading correction factor air changes/hr	/			/	0%	
2	Building Energy Per	formance							
2.1	Energy demand per	m2 of tota	Il used conditioned floor area (kWh / m2yr) inc	I. system losses		National			
energy	suggested			New or	National	regulation for refurbished			
existing building	energy carrier		specify energy efficiency measures	existing building [5]	regulation for new built [6]	normal practice (6a)	suggested specification [7]	Additional energy savings	
Heating + ven	tilation								
Gas-fired	District Heating - Gas-								
Boilers	fired CHP kV	Vh/m²yr	Smart meters, smart controls	78			78	0%	
Cooling + ven	tilation kV	Vh/m²yr	No cooling					0%	
Ventilation (if	separate from heating/	cooling)							
	kV	Vh/m²yr	Natural ventillation					0%	
Lighting	electricity kV	Vh/m²yr	Smart Controls	21			21	0%	
Domestic Hot	Water (DHW)								
Gassfired	District Heating - Gas-								
Boilers	fired CHP kV	Vh/m²yr	Smart meters, smart controls	20			20	0%	
Other energy	demand kV	Vh/m²yr						0%	
	F10	Vh/m ² vr	Subtotal cum of operate domand	110	0	0	110	0%	
				113		0	113	070	
	Appliances (please in ICT/White	ndicate, bu	t costs are not eligible) Demand-side management, but no overal						
2.2	Goods kV	Vh/m²yr rm2 of to	energy savings assumed - load shifting.	43	I			0%	
	1120 00111 Bullon po					regulation for			
total production	٨٧	v		New or existing	National regulation for new	buildings or normal	suggested	RES increased	
kWh/yr	m ² installed ins	stalled	specify RES measures	building [5]	built [6]	practice (6a)	specification [7]	contribution [%]	
								0%	
								0%	
	kV	Vh/m ² yr	Subtotal sum of RES contribution	0	0	0	0	0%	
3	Building Energy Use	9	per m ² of total conditioned/heated floor area (kW	/h/m2 yr)		National			
				New or	National	regulation for refurbished buildings or		improvement from regulation for	
				existing building [5]	regulation for new built [6]	normal practice (6a)	suggested specification [7]	refurbished/normal practice	
	kV	Vh/m²yr	Subtotal sum of RES contribution	0	0	0	119 0	0.00	
	kV	Vh/m²yr	Total Building Net Energy Use	119	0	0	119	0.00	
А	Other national over	all energy	performance targets or criteria (additional infor	mation, mandatory if e	xistina)				
-		81		, manadory II 6		National regulation for			
				New or	National	refurbished buildings or			
	Ur	nits [8]	explain content and scale [9]	existing building [5]	regulation for new built	normal practice	suggested specification		

Building I	Energy Specific	ation	Table (BEST)	Community / site	Exchange House	BEST no	D.		
(to be completed)	Building Category de	[1] scription	other Local Authority Office Building	total area / ca	Ƨිරිස්ස්ස් w	ith docume	nt Ref_AF&®(2	016)5910251 -	13/10/2016
1.2	Local Climate			January average out	side temperature	°C	3		
	Climatic Zone		Oceanic	August average outs Average global horiz	side temperature contal radiation	°C kWh/m² yr	15 860		
	(national definition)		(Köppen climate classification)	Annual heating degr	ee days [3]	°Cd/yr	2741		
						National regulation for			
				New or	National	refurbished buildings or	suggested		
1.3	Maximum requireme	ents of bui	lding fabric	building [5]	built [6]	practice (6a)	specification [7]	Reduction %	
	Façade/wall Roof	U U	W / m2K W / m2K	1.5 0.13			1.5 0.13	0% 0%	
	Ground floor Glazing	U Ug	W / m2K W / m2K	0.13			0.13	0%	
	Average U-value Glazing	U _{av} g	W / m2K total solar energy transmittance of glazing [%]	- /			/	0%	
	Shading Ventilation rate [4]	Fs	Shading correction factor air changes/hr	/			/	0%	
2	Building Energy Per	formance							
2.1	Energy demand per	m2 of tota	Il used conditioned floor area (kWh / m2yr) inc	I. system losses		National			
energy	suggested			New or	National	regulation for refurbished			
existing building	energy carrier		specify energy efficiency measures	existing building [5]	regulation for new built [6]	normal practice (6a)	suggested specification [7]	Additional energy savings	
Heating + ven	tilation								
Gas-fired	District Heating - Gas-								
Boilers	fired CHP kW	/h/m²yr	Smart meters, smart controls	86			86	0%	
Cooling + ven	tilation kW	/h/m²yr	No cooling					0%	
Ventilation (if	separate from heating/	cooling)							
	kW	/h/m²yr	Natural ventillation					0%	
Lighting	electricity kW	/h/m²yr	Smart Controls	23			23	0%	
Domestic Hot	Water (DHW)								
Gassfired	District Heating - Gas-								
Boilers	fired CHP kW	/h/m²yr	Smart meters, smart controls	15			15	0%	
Other energy	demand kV	/h/m²yr						0%	
	F/V	/h/m ² vr	Subtotal cum of operate domand	124	0	0	124	0%	
				124		0	124	070	
	Appliances (please in ICT/White	ndicate, bu	t costs are not eligible) Demand-side management, but no overal						
2.2	Goods kW	/h/m²yr rm2 of to	energy savings assumed - load shifting.	50	I			0%	
						regulation for			
total production	kW	V		New or existing	National regulation for new	buildings or normal	suggested	RES increased	
kWh/yr	m ² installed ins	stalled	specify RES measures	building [5]	built [6]	practice (6a)	specification [7]	contribution [%]	
								0%	
								0%	
	kΜ	/h/m²yr	Subtotal sum of RES contribution	0	0	0	0	0%	
3	Building Energy Use	2	per m ² of total conditioned/heated floor area (kW	/h/m2 yr)		National			
				New or	National	regulation for refurbished buildings or		improvement from regulation for	
	,	1h/m ²	Puktatal aum of one of the	existing building [5]	regulation for new built [6]	normal practice (6a)	suggested specification [7]	refurbished/normal practice	
	kV kV	/h/m²yr	Subtotal sum of RES contribution	124	0	0	124	0.00	
	κV	/h/m²yr	Total Building Net Energy Use	124	0	0	124	0.00	
А	Other national overa	llenerav	performance targets or criteria (additional infor	mation, mandatory if e	xistina)				
-		81		, manadory II 6		National regulation for			
				New or	National	refurbished buildings or			
	Un	iits [8]	explain content and scale [9]	existing building [5]	regulation for new built	normal practice	suggested specification		

Building I	Energy Specifi	cation 1	Table (BEST)	Community / site	City Chambers	BEST no	D.		
(to be completed)	Building Category	[1] escription	other Local Authority Office Building	total area / ca	ARES රිස්ස්ස් w	vith docume	ent Ref_Alf&&(2	016)5910251 -	13/10/2016
1.2	Local Climate			January average out	tside temperature	°C	3		
	Climatic Zone		Oceanic	August average outs Average global horiz	side temperature contal radiation	°C kWh/m² yr	15 860		
	(national definition)		(Köppen climate classification)	Annual heating degr	ee days [3]	°Cd/yr	2741		
1.3	Maximum requireme	ents of bui	Iding fabric	New or existing building [5]	National regulation for new built [6]	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Reduction %	
	Façade/wall Roof	U	W / m2K W / m2K	0.8			0.8	0%	
	Ground floor Glazing	U U Ug	W / m2K W / m2K	1 4.8			1	0%	
	Average U-value Glazing	U _{av} g	W / m2K total solar energy transmittance of glazing [%]	- /			- /	0% 0%	
	Shading Ventilation rate [4]	Fs	Shading correction factor air changes/hr	/			/	0% 0%	
2	Building Energy Per	rformance							
2.1	Energy demand per	m2 of tota	al used conditioned floor area (kWh / m2yr) inc	I. system losses		National			
energy						regulation for refurbished			
carrier existing	suggested energy		anosity anaray afficiancy massures	New or existing	National regulation for new	buildings or normal	suggested	Additional energy	
Heating + ven	tilation		specify energy enciency measures	building [5]	buit [6]	practice (ba)	specification [7]	savings	
	District								
Gas-fired Boilers	Heating - Gas- fired CHP kV	Vh/m²yr	Smart meters, smart controls	142			142	0%	
Cooling + ven	tilation	A / la / ma ² , m						00/	
Ventilation (if	separate from heating/	/cooling)						0%	
	kV	Wh/m²yr	Natural ventillation					0%	
Lighting	electricity KV	N/b/m ² /r	Constrain	22			22	0%	
Domestic Hot	Water (DHW)	vii/iii yi	Smart Controls	23			23	0%	
	District								
Gas-fired Boilers	Heating - Gas- fired CHP kV	Vh/m²yr	Smart meters, smart controls	20			20	0%	
Other energy	demand	Wh/m ² vr						0%	
	KV	/Vh/m²yr	Subtotal sum of energy demand	185	0	0	185	0%	
	Appliances (please i	ndicate, bu	it costs are not eligible) Demand-side management, but no overal						
	Goods kV	Wh/m ² yr	energy savings assumed - load shifting.	53				0%	
2.2	RES contribution pe	er m2 of to	tal used conditioned area (KWh / m2 yr)			regulation for			
total production	k٧	N		New or existing	National regulation for new	buildings or normal	suggested	RES increased	
kWh/yr	m ² installed in:	stalled	specify RES measures	building [5]	built [6]	practice (6a)	specification [7]	contribution [%]	
								0%	
								0%	
	kV	Wh/m ² yr	Subtotal sum of RES contribution	0	0	0	0	0%	
3	Building Energy Use	e	per m^2 of total conditioned/heated floor area (kW	/h/m2 yr)		National			
				New or	National	regulation for refurbished buildings or		improvement from regulation for	
	14)	A / la / ma ² 1 m	Outstated some of an annual source of	existing building [5]	regulation for new built [6]	normal practice (6a)	suggested specification [7]	refurbished/normal practice	
	kV kV	Nh/m ² yr	Subtotal sum of RES contribution	0	0	0	0	0.00	
	kV	Vh/m²yr	Total Building Net Energy Use	185	0	0	185	0.00	
А	Other national over	all energy	performance targets or criteria (additional infor	mation, mandatory if e	xisting)				
-	and an order			, manadory II 6		National regulation for			
				New or	National	refurbished buildings or	ou on o - 4 - 4		
		nits [8]	explain content and scale [9]	existing building [5]	regulation for new built	normal practice	suggested specification		

Building	Energy Spec	ification ⁻	Table (BEST)	Community / site	23 Montrose Street	BEST no			
(10 be complet 1.1	Building Catego	ry [1] description	other Local Authority Office Building	total area / ca	Associated v	vith docume	nt Ref. Arga	Q16)5910251 -	13/10/20
1.2	Local Climate Climatic Zone (national definitio	n)	Oceanic (Köppen climate classification)	January average out August average outs Average global horiz Annual heating degre	side temperature ide temperature ontal radiation ee days [3]	°C °C kWh/m ² yr °Cd/yr	3 15 860 2741		
1.3	Maximum requir Façade/wall Roof Ground floor Glazing Average U-value Glazing Shading Vertifician sets 14	rements of buil U U U U U av Fs	Iding fabric W / m2K W / m2K W / m2K W / m2K W / m2K total solar energy transmittance of glazing [%] Shading correction factor	New or existing building [5] 0.8 0.45 1 4.8 - / / /	National regulation for new built [6]	National regulation for refurbished buildings or normal practice (6a)	suggested specification [7] 0.8 0.45 1 4.8 - //	Reduction % 0% 0% 0% 0% 0% 0% 0% 0% 0%	
2	Puilding Energy	Derformence	air changes/nr	/			1	0%	
2.1	Energy demand	per m2 of tota	al used conditioned floor area (kWh / m2yr) inc	cl. system losses		Notice-1			
energy carrier existing building Heating + ven	suggested energy carrier ntilation		specify energy efficiency measures	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	Additional energy savings	
Gas-fired Boilers	District Heating - Gas- fired CHP	kWh/m ² yr	Smart meters, smart controls	48			48	0%	
Cooling + ven	ntilation	kWh/m²yr	No cooling					0%	
Ventilation (if	separate from hea	ting/cooling) kWh/m ² vr	Natural ventillation		·			0%	
Lighting									
Domestic Hot	electricity t Water (DHW)	kWh/m²yr	Smart Controls	5			5	0%	
Gas-fired Boilers	District Heating - Gas- fired CHP	kWh/m ² yr	Smart meters, smart controls	0			0	0%	
Other energy	demand	kWh/m²yr						0%	
		kWh/m²yr	Subtotal sum of energy demand	53	0	0	53	0%	
	Appliances (plea	ase indicate, bu	it costs are not eligible)						
	ICT/White Goods	kWh/m²yr	Demand-side management, but no overal energy savings assumed - load shifting.	53				0%	
2.2 total production kWh/yr	RES contribution	n per m2 of to kW installed	tal used conditioned area (kWh / m2 yr) specify RES measures	New or existing building [5]	National regulation for new built [6]	regulation for refurbished buildings or normal practice (6a)	suggested specification [7]	RES increased contribution [%]	
								0% 0% 0%	
								0%	
		kWh/m²yr	Subtotal sum of RES contribution	0	0	0	0	0%	
3	Building Energy	Use	per \ensuremath{m}^2 of total conditioned/heated floor area (kW	/h/m2 yr)		National regulation for		improvement from	
		kWh/m ² yr kWh/m ² yr kWh/m ² yr	Subtotal sum of energy demand Subtotal sum of RES contribution Total Building Net Energy Use	New or existing building [5] 53 0 53	National regulation for new built [6] 0 0	refurbished buildings or normal practice (6a) 0 0	suggested specification [7] 53 0 53	Improvement from regulation for refurbished/normal practice 0.00 0.00	
4	Other national o	verall energy	performance targets or criteria (additional infor	mation, mandatory if e	kisting)	N-Al-			
		Units [8]	explain content and scale [9]	New or existing building [5]	National regulation for new built	National regulation for refurbished buildings or normal practice	suggested specification		

1

2

10 Annex E Lighthouse Cities – TEST Tables 10.1 Partner 1: City of Rotterdam

Transport Energy Specification Table (TEST

Fransport Energy Specification Table (TES	T)
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	4	electricity (bus)	
	2	hydrogen (bus)	
total	6		
N			
Number of the	recharging/ refuelling units	in the infrastructure that will be deployed in the project	
Number of the	recharging/ refuelling units Units [3]	in the infrastructure that will be deployed in the project explain content and scale [4]	
Number of the	Units [3]	in the infrastructure that will be deployed in the project explain content and scale [4] electric recharging units for large vehicles	
Number of the	Units [3]	in the infrastructure that will be deployed in the project explain content and scale [4] electric recharging units for large vehicles (bus/truck/van); privately accessible	
total	Units [3]	in the infrastructure that will be deployed in the project explain content and scale [4] electric recharging units for large vehicles (bus/truck/van); privately accessible	

Estimation of CO2 savings obtained through the sustainable urban mobility solutions deployed in the project, on the basis of CO2 intensity of the European electricity grid of in 430 g CO2/kWh.

use of 2 hydrogen busses use of 4 electric busses energie huidig energie reductie 3,2 miljoen kWh 1,9 miljoen kWh

30 h 120 2

3

10.2 Partner 2: City of Umeå

Transport Energy Specification Table (TEST)

1 Size of the entire vehicle fleet powered by alternative energy carriers that will be deployed in the project

	20	electric taxis
total		
Number of the re	charging/ refuelling uni	ts in the infrastructure that will be deployed in the project
	Units [3]	explain content and scale [4]
	1	e-charging hub including charging availability for e-bikes, e-cars and car-share.
	20	semi-fast chargers 16 A
total		
total		

the basis of CO2 intensity of the European electricity grad of in Foug Co2. ensity of the B ropean electricity grid of in 430 g CC)2/kWh.

20 e-taxis saves 128 tonnes CO2 per year compared to petrolfuelled taxis. 20 semi-fast chargers can potentialy save 617 tonnes CO2 (including the saving from the 20 taxis)per year compared to petrolfuelled cars driving the same distance

10.3 Partner 3: City of Glasgow

Transport Energy Specification Table (TEST)

total

3

1 Size of the entire vehicle fleet powered by alternative energy carriers that will be deployed in the project



2 Number of the recharging/ refueling units in the infrastructure that will be deployed in the project



Estimation of CO2 savings obtained through the sustainable urban mobility solutions deployed in the project, on the basis of CO2 intensity of the European electricity grid of in 430 g CO2/kWh.

Electricity emissions		0.5331	kgCO2/kWh				
Diesel emissions		0.285176	koC/O2/mile				
Car type	Capacity (kWh)	Miles			kWh/mile	CO2/mile (kgCO2/kWh)	CO2/mile (tCO2/kWh)
Nissan Leaf	24	100)		0.24	0.127944	0.00012794
			Time to charge				
Charger type	kW	Time in Units	NL (hrs)	Litres in a Gallon	4.54609	1	
Frank							
Fast	22	1.64	1 nour 38 mins				
Rapid	50	0.72	43 mins				
C 1000							
SIDW	7	6.86	endurs 51 mins				
						# vehicles	# fuel cost diff
NB 1 charger = 2				tCO2 saving Year 2 (4 fast			
charging bays				bays, 1 rapid bays)	54.857748	4380	4380
Fast Charger		Rapid Charger		tco2 saving Year 3 (6 fast			
Assumptions		Assumptions		bays, 3 rapid bays)	109.715496	8760	8760
		A rapid charger can charge a car buice					
		during the time a fast		tCO2 saving Year 4 & 6 (8			
Mies per charge	100	charger charges once	2	fast bays, 4 rapid bays)	146.287328	11680	11680
Average No. of charge per	5	rapid charger no. of		tCO2 saving			
annum per bay (fast		charges per annum		acoumulation over 4			
charger)	730	perbay	1460	years	\$10.880672	11680	11680
Total wastly miles par		Total uparty					
bay	73000	miles per rapid bay	146000			£/mile	£/8CO2
tCO2 per mile Nissan		tCO2 per mile Diesei					
Leaf	0.00015993	car	0.000285176	100 miles in diesel car	3	0.03 £/mile	0.0000047979
1000	0.000405046		0.000105016	100 miles la significa en		0.43.61=1=	0.00004/53030
1002 saving per mie	0.000125246	0002 saving per mile	0.000125245	too miles in electric car	13	0.13 Emile	0.0000162820
tCO2 saving per fast		tCO2 saving per rapid					
-							

11 Annex F Replication and investment Plan

11.1 F.1 Brno – Replication and Investment Plan

11.1.1 City Vision

Smart City Brno Concept was approved by Brno City Council in October 2015. the main motto of Smart City vision is "A city which cleverly, sensibly and effectively uses modern technology and approaches leading to an improvement in quality of life there, to its effective governance, to the preservation of natural resources and energy sustainability".

The extent of the Smart City issues is extremely broad and touches all areas of the city of Brno. In this concept whenever the term "city" is used, it is taken as meaning the whole including the municipal companies and contributory organisations.

- Smart resources Resources (city mobility, power and sustainability, buildings and urban development)
- Smart living Quality of life (the environment and public spaces, health and social care, recreation and quality of life)
- Smart governance Public administration (effective management, innovative planning and new technology, transparency and openness of authorities, security, support for business, education and communication with citizens)

The basic principles that should lead to a wider and long-term cooperation between the city and its partners in particular are:

Openness – the city should be open to ideas, stimuli and solutions and through a transparent and effective use of its data make it possible new solutions, applications, impetuses to business as well as the creation of new jobs and services.

Responsibility – to develop the city in such a way that future generations will experience a high quality of life, functioning services and a high degree of security and order in the city.

Modularity – the city ecosystem will allow the city to find out optimum and reasonable technological solutions that do not lead to dependence on suppliers. It also allows removing services (applications, modules, technology) that no longer fulfil the needs of the city's users by replacing them with new and more effective solutions.

Thoughtfulness – towards the city's inhabitants and the environment –to govern the city so that the development does not have a negative impact on the environment (quality of life in the city), and where it is unavoidable, there is compensation for the negative impacts of development.

Effectiveness city should see its development as an opportunity for using solutions which have potential of job creation and economic development. At the same time it should be efficient and thrifty in its administration (low operational energy consumption and running costs). Part of this will be innovative business models allowing primarily for the engagement of SMEs including start-ups, for which the city is creating a supportive environment.

Diversity – in its development the city should supports diversity of solutions to enable citizens chose an optimal solution from their perspective. City should thus improve the accessibility to the various part of the city by reducing and simplifying the travel routes for the interested audience and thus saving time and energy demand. **Cleverness** – the city should make effective use of the potential knowledge at its disposal and find ways to make use of it in both long term development and in its everyday business. Not only centres of excellence in science but also promising start-ups can be utilised by the city as its "laboratory" to develop its reference ecosystem.

In lighthouses smart solution portfolio we find out items which should be designed and adopted during the project. Other lighthouse solutions are inspirations which should be studied and have a potential to become a concrete smart solution in time.

11.1.2 Replication and Investment Plan

11.1.3 Replication Area

There are three main replication areas:

Brno Exhibition Centre - offers more than 130,000 sq m of net exhibition area thus ranking among the world largest exhibition centres. Brno Exhibition Centre first opened in 1928 commemorating the first decennium of independent Czechoslovakia founded in 1918. Brno as a location for the new exhibition centre was chosen on purpose being conveniently situated between Prague and Bratislava.

"Jižní Centrum" - The southern portion of the centre of Brno is a unique locality that has long remained an

architecturally passive zone. Its formation was the result of the unplanned interweaving of rail lines and the initial growth and later decline of industrial production over the past 150 years. This prominent and complex brownfield, an area open for development, is slowly being transformed on the level of individual building activities.

"Lužánky" – large area of sports and leisure time infrastructure. In last decades of 20th century there were three important symbols of Brno's sport infrastructure: Swimming pool, old football stadium and ice-hockey stadium in very bad shape. Furthermore a hotel, commercial activities and others leisure time activities were added in 90's. Nowasays the area has a great development potential.

A portfolio of brownfields should serve for demonstration of any inspiring lighthouse solution. Brno has some 378 ha of underutilised or neglected sites mostly left over from the transformation process after 1989. The preferred localities for the further development of business activities, housing and other city functions are these brownfield sites, which can often offer an attractive location in an already built-up area connected to existing technical infrastructure.

11.1.4 Smart Solutions

Investment costs are estimated by experts and may change in time based on location, time, technology, knowledge exchange between cities. Portfolio of smart solutions as well as list of key partners can be extended or shortened. It depends basically on further development and cooperation within whole consortium.

B1 – **Smart street lighting** – in "Jižní centrum" southern centre part of Brno a new system of public lighting will be realized, including LED technology with light regulation, integrated EV charging, wireless communication network, transport and environmental sensors. **Connected with R11, G6.**

B2 – Thermal grid and energy storage – in "Lužánky" sport and leisure time area and large trade-fairs area "Veletrhy Brno" will be solved with thermal grid and waste heating storage. **Connected with R2.**

B3 – **City heating network lower temperature grid** – heating infrastructure in broader city center will be reconstructed into lower temperature grid. **Connected with R1.**

B4 – **Photovoltaics** – use RES as a part of electric smart grid in "Veletrhy Brno" trade fairs, public buildings. **Connected with G4**

B5 – **E-mobility charging infrastructure** – in "Veletrhy Brno" trade fair area a parking house building will use RES and battery storage for E-charging hub for private cars, public transport, car sharing mode of e-mobility working as grid balancing mechanism. **Connected with G3, G5, U6.**

B6 – **Energy management** – infrastructure for smart metering will be set in public buildings, connected into dynamic system based on open platform to promote energy efficiency behaviour. **Connected with R8**

B7 – **Smart waste management** – cooperation between waste management municipal company and transport management company. Set up sensors in containers to monitor filling of containers and developing new dynamic models for optimization of waste transport routes. **Connected with R13.**

B8 – **Visualisation in 3D operational city model** – Visualisation of all kind of available data (mobility, energy, waste, water, etc) in 3D model supports decision making process, promoting RES and energy efficiency behaviour and alternative mobility solution. **Connected with R9.**

B9 - Smart Open Data city Decision platform – Open Data city Decision platform empowers not only city decision making process. it also helps new businesses, start-up community, research, application market, creates new jobs in new industries. **Connected with U8, G7**

B10 - Energy-efficient land use policy - Through flexible green parking pay off - New building and development policy for land use will be set to help sustainable mobility, energy savings and prevents CO2 pollutions. – **Connected with U7**

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Business model canvas for the Smart solutions included in the Replication Plan_BRNO

Key End Users (Main beneficiaries)	City utility companies, citizens, start- ups, local businesses	City utility companies, citizens, local businesses	City utility companies, citizens, local businesses	City utility companies, citizens, visitors of trade fairs, local businesses	Citizens, city utility companies, visitors of trade fairs, local businesses
User Relationships (Involvement and awareness of citizens and businesses)	Apps, idea camps, city hacks, expert workshops, open call for business solutions	Websites, workshops with users, promoting energy efficiency citizens behaviour	Promoting energy efficiency citizens behaviour, expert workshops, open call for business solutions	Promoting energy efficiency citizens behaviour, RES solutions promotion demonstration, citizens participation in calls on RES solution, expert workshops, idea camp, city hack	Expert workshops, idea camps, city hack, open call for business cooperation
Value Proposition (Added value for the city)	New services for users, supporting E-mobility, data flow from mobility and environment for modelling and policy making. Energy savings	Energy savings, optimizing heat peaks, grid advantages in heating management.	Energy savings, increased efficiency of heating infrastructure	Lowering energy dependency in area, energy savings, promoting RES solution, advantages of grid infrastructure	Promotion of e-mobility, RES solution, increase of e- mobility transport in modal split,
Key Resources (Physical and human)	City network company, Brno University of Technology, Transport management company, new infrastructure of public lighting	City CHP company, Brno University of Technology, Brno Trade Fairs, Buildings, heat infrastructure	City CHP company, Brno University of Technology, heat infrastructure	City CHP company, Brno University of Technology, Brno Trade fair company, buildings, City network management companies, PV solutions.	City public transport company, City transport management company, Brno Trade fairs company, Brno University of Technology, parking house, charging hub,
Key Activities	New system of public lighting. Including LED technology with light regulation, integrated EV charging, wireless communication network, transport and environmental sensors.	Thermal grid and waste heating storage.	Reconstructing of heating infrastructure into lower temperature grid	RES as a part of electric smart grid	parking house building RES and battery storage for E-charging hub
Key Partnership	BKOM, TSB, BUT, JIC	Teplárny, BVV, BUT	Teplárny, BUT	Teplárny, BUT, BVV, TSB	DPMB, BKOM, BVV, TSB, BUT
Smart Solution (Name and relation to lighthouse solutions)	B1 Smart street lighting - R11, G6	B2 – Thermal grid and energy storage - R2	B3 – City heating network lower temperature grid - R1	B4 – Photovoltaics - G4	B5 - E-mobility charging infrastructure - G3, G5, U6
Sector (SIP sectors)	ш	ш	ш	ш	Σ

0251 - 13/10/2016	Key End Users (Main beneficiaries)	City utility companies, citizens	City utility companies, citizens, local business, start- ups	City utility companies, citizens, start- ups, local businesses	City utility companies, citizens, start- ups, local businesses	City utility companies, citizens, start- ups, local businesses, developers
ument Ref. Ares(2016)591	User Relationships (Involvement and awareness of citizens and businesses)	Apps, idea camps, city hacks, expert workshops, open call for business solutions	Apps, idea camps, city hacks, expert workshops, open call for business solutions	Apps, idea camps, city hacks, expert workshops, open call for business solutions	Apps, idea camps, city hacks, expert workshops, open call for business solutions	Apps, idea camps, city hacks, expert workshops
Associated with doci	Value Proposition (Added value for the city)	Promotion of energy efficiency behaviour, empowering decision making processes, energy savings	Optimization of waste transport routes, decreasing waste mobility,	Supports decision making process, promoting RES and energy efficiency behaviour and alternative mobility solutions	Empowers city decision making process. Also helps new businesses, start-up community, research, application market, creates new jobs in new industries	Supports sustainable mobility, energy savings and prevents CO2 pollutions
⁻ IER: H2020-SCC-2016-2017	Key Resources (Physical and human)	City network company, Brno University of Technology, smart metering solutions, open platform, public buildings, City property department	City waste management company, City public transport company, City transport management company, City network company, Brno University of Technology, sensors in containers,	City network management company, data providers, Brno University of Technology, ICT platform	City network management company, City mobility management company, City public transport company, City waste management company, Brno University of Technology, ICT platform	
SED CALL IDENTII	Key Activities	Infrastructure for smart metering, dynamic system, open platform.	sensors in containers, new dynamic models for optimization of waste transport routes	Data visualisation (mobility, energy, waste, water, etc) in 3D model,	Open Data city Decision platform	New building and development policy for land use
RUGGEDIS	Key Partnership	TSB, BUT	SAKO, DPMB, BKOM, TSB, BUT	TSB, data providers, BUT	TSB, BKOM, DPMB, SAKO, BUT	BKOM, DPMB, TSB, STAREZ, BUT
	Smart Solution (Name and relation to lighthouse solutions)	B6 – Energy management - R8	B7 – Smart waste management- R13	B8 – Visualisation in 3D operational city model- R9	B9 - Smart Open Data city Decision platform- U8, G7	B10 - Energy- efficient land use policy - U7
SCC-1-2016	Sector (SIP sectors)	ш	Σ	-	-	-

Estimated Investment Plan_BRNO

Smart Solution

710 000 €

Cost

238

(Date of funding availability) **Funding Timeline**

[Funding source and scheme (e.g. public, private, PP, crowdsourcing, etc.)] City budget, private, PPP, EU, city companies

Funding Source and Scheme

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Funding Timeline (Date of funding availability)	2021	2021	2021	2021	2021	2021	2021	2021	2021
Funding Source and Scheme [Funding source and scheme (e.g. public, private, PP, crowdsourcing, etc.)]	City budget, private, PPP, EU, city companies								
Estimated Cost	180 000 €	1 790 000 €	710 000 €	1 070 000 €	290 000 €	70 000 €	40 000 €	40 000 €	70 000 €
Smart Solution	B2	B3	B4	B5	BG	B7	B8	B9	B10

Replication Roadmap_BRNO

	Other Phases										
	Deployment	2022	2022	2024	2022	2024	2022	2022	2022	2022	2023
	Procurement	2021	2020	2022	2021	2022	2021	2019	2021	2020	2021
Design	(Business model, technical requirements, other)	2020	2019	2020	2019	2020	2019	2018	2019	2018	2019
	Smart Solution	81	B2	B3	B4	B5	B6	87	B8	B9	B10

11.1.5 Integration and Long-Term Sustainability of the Smart Solutions

City ecosystem which is improved within this project should guarantee a long-term sustainability of Smart Solutions. Inputs and ideas of all stakeholders within quadruple-helix model will be involved within vision, plans, goals and activities.

There are several conditions for successful execution of Smart Solutions and their long-term sustainability and for building a long-term correct relation with the city ecosystem.

- To create a simple and functioning communication platform (external and internal part), which will be used and updated primarily by the city.
- To create a functioning city ecosystem and keep it engaged and regularly informed
- To communicate sufficiently and cooperate on all levels of the city including its contributory organisations and city companies in which the city is the majority owner
- To change the approach of the city to strategic questions a holistic approach (not by sectors but the city as a whole)
- To support innovative business (create an environment for a knowledge-based economy)
- To utilise the knowledge potential of the city and its users
- To secure and apply verified analytical information and data for further strategic decision-making
- To provide verified data sets
- Where the city decides develop an idea or implements a concrete solution, it must always be an essential condition to provide the possibility of engaging to the person or people who initiated and created this idea or solution.

11.2 F.2 GDASK – Replication and Investment Plan

11.2.1 City Vision

The vision of Gdansk development has been outlined in "Gdańsk 2030 Plus Development Strategy", which has been prepared in cooperation with citizens within a participatory process. The strategy defines 5 major development areas:

- "Education and social capital" focuses on improving accessibility of educational and care services, the quality
 of school education, social cohesion and supporting socially excluded people and people at risk of social
 exclusion, and increasing the inhabitants' involvement in the city's affairs;
- "Economy and transport" seeks to increase the number of jobs and the share of public transport and pedestrian and bicycle traffic in the inhabitants' travels;
- "Public space" shall increase the number of inhabitants satisfied with public space and improve the quality and accessibility of recreational areas;
- "Culture" is supposed to increase the level of inhabitants' and tourists' participation in culture and the level of inhabitants' identification with Gdańsk;
- "Health" is oriented towards the improvement of the state of the inhabitants' health and increasing the level of physical activity among inhabitants.

The overview of Gdansk Strategy is available on the web.²²

On December 17th, 2015 the City Council has adopted the resolution that defines 8 operational programmes (up to 2023) to implement the strategy. The programmes are:

- 1. Education
- 2. Public health and sport
- 3. Social inclusion and active citizenship
- 4. Culture and Leisure
- 5. Innovation and entrepreneurship
- 6. Investment attractiveness
- 7. Infrastructure
- 8. Mobility and transport
- 9. Public space

The investment plan proposed by Gdansk as its replication project is covered in 7th and 8th operational programmes. Among others, the objectives of the "Infrastructure" programme are to ensure the improvement of energy efficiency, energy security and reduce greenhouse gas emissions in the city and metropolitan area and account for sustainable management and protection of the natural environment. On the other hand the "Mobility and transport" programme highlights the development of modern, sustainable transport systems hiking, cycling, and associated public transport for improving the conditions of everyday mobility and also offers complementary actions for energy efficiency and security, energy security and greenhouse gas emissions reduction.

Gdansk has adopted Low-Carbon Economy Plan (PGN) in December 2015 and is currently undergoing SEAP certification by the Covenant of Mayors. The city has been involved in ACCUS (ARTEMIS/FP7) research and development project to provide smart city operating system to integrate and coordinate distributed urban systems. The platform will be implemented to aggregate data from urban systems (e.g. intelligent transportation system TRISTAR) and deliver them to open-data platform (CKAN) for application developers. Gdansk is also a role-model city when it comes to implementation of open-data standards. In last quarter of 2014 "City of Gdansk Manifesto of Openness" was proclaimed. Gdansk representatives declared that the city would continuously open municipal and public data resources for citizens and industry in order to provide access to data gathered, processed, and stored with the use of public funding.

²² <u>http://www.gdansk.pl/urzad/plik,58379.html</u> (English version, retrieved March 23rd, 2016).

11.2.2 Replication and Investment Plan

11.2.3 Replication Area

Gdansk (area of 262 km²; population 462,000) is a district city and the capital of Pomeranian Voivodeship located on the coast of Baltic Sea in the region of Zulawy (an alluvial lowland of the Vistula River) and Kaszuby Lakeland. Together with **Gdynia** (268 thousand citizens) and **Sopot** (almost 40 thousand inhabitants), Gdansk forms the **Tricity metropolis** with total population of approximately **750 thousand citizens**.

Apart from the role of Gdansk in the Tricity metropolis, Gdansk is **major city of the Gdansk Agglomeration**. Other cities included in the agglomeration are: Gdynia, Hel, Jastarnia, Kartuzy, Pruszcz Gdanski, Reda, Rumia, Tczew, Sopot, Wejherowo, Zukowo. More than **1.25 million citizens** living on the area of 3,719 km2 inhabit the entire agglomeration.

The projects included in the replication plan will be implemented in **Gdańsk Śródmieście ("Downtown")** district which is the traditional area of Gdansk, where the old town is located.



Figure 3: Gdańsk Śródmieście and other city districts (left) and Location of Gdańsk Śródmieście district (right)

The quarter covers 5.65 km² and is populated by 29,630 inhabitants which gives population density of approximately 5244 persons per square kilometer.

The smart solutions proposed here will be deployed on the ground of replication plans elaborated within the scope of SCC-01-2016 "Next Economy" proposal. Their role is to offer activities complementary to building insulation, thermo-modernization, heat-network connection, which will offer innovative edge to the typical construction/refurbishment investments.

11.2.4 Smart Solutions

GDA1. RES-ready urban energy management system: The objective of the project is to implement horizontal solutions for energy management that will be used in wide range of urban investment projects in Gdansk. The solution should be RES-ready in that respect that it enables integration of PV panels and/or wind turbines as well as supports energy delivery, storage, and grid interfacing for RES. This solution includes deployment of software platform to integrate CPSs (cyber-physical systems), telemetry, and telematics components. Model lighthouse solutions: R8, R10.

GDA2. Advanced energy management and integration system for public school building: Gdansk plans complete refurbishment and thermo-modernization of a public school building located Downtown area (stage one). Further, project includes BEMS (building energy management system), employment of RES (especially, PV panels), energy-storage and proper energy-grid integration (stage 1). The investment assumes a public-private partnership (PPP) with energy/heat provider EDF company and Schneider-Electric. Project will involve SME sector (e.g. Eco-Construction) focused on the integration of RES with building-heating systems, smart HVAC solutions adjusted to building exploitation profiles, including air-ionization technologies. Project will be carried out in cooperation with Gdansk Thermal Energy company (GPEC). Model lighthouse solutions: R5, G4, U1.

GDA3. Refurbishment, modernization, and ICT-integration for buildings in Lastadia street: The project covers refurbishment and construction works in Lastadia street buildings that will also include connection of the buildings with urban heating network (stage 1). Beyond that, in stage 2, Gdansk will deploy smart building technologies, including energy management system and building automation in line with the smart home

approach. Advanced integration with RES (PV, storage, grid) is also planned. This project also implements energy-storage and proper energy-grid integration solutions. Project will be carried out in cooperation with Gdansk Thermal Energy company (GPEC) and Gdansk Drainage company (GDMEL). The investment will be financed by metropolitan Integrated Territorial Investments fund (ZIT) and municipal company GDMEL. Model lighthouse solutions: U4, U1, G4, R5.

GDA4. Sewage-heat recovery for bicycle-path defrosting: Gdansk plans to implement sewage-heat recovery solutions (distributed sewer collectors and heat recovery technology) that will be used for bicycle-path thawing during winter season. Project will be carried out by Gdansk City Hall and municipal company Gdansk Water and Sewers Infrastructure (GIWK). It is also planned to sell the surplus of the recovered thermal energy to Gdansk Thermal Energy company (GPEC). Although one of the challenges is that the exploitation of the water-sewer infrastructure has been financed with public funds and cannot be used by the city to make profit. This requires legal solutions and appropriate business models. Model lighthouse solutions: R2, R4.

GDA5. EV charging points: Currently there are 3 EV charging points in Gdansk. It is planned that further 10 will be deployed. Some of the planned EV charging points will be located in Gdansk Downtown area. Charging infrastructure will be integrated with street lighting system. The project includes ICT integration and tools for the management of EV recharging points as well as employment of Renewable Energy Sources and complementary energy-storage solutions. Model lighthouse solutions: U6, G5.

GDA6. Geographic Information System for heat, electricity, and water network: The objective is to develop digital maps and GIS technology for heat, electricity, and water networks together with decision-support and planning tools. The solution will help to rationalize and synchronize maintenance and construction activities across all departments in Gdansk city hall and cooperating actors. Gdansk will cooperate with energy provider Energa SA, Gdansk Water and Sewers Infrastructure (GIWK), GPEC (Gdansk Thermal Energy). Model lighthouse solutions: R9, G7.

GDA7. Open data standards for energy consumption monitoring in public buildings: Gdansk implements its "Open Gdansk" policy and plans to pen data regarding energy consumption in public buildings. The exposure of other sets of municipal data is also planned. Gdansk may use ACCUS platform (a result of EU-funded R&D project) as a gateway to integrate energy systems and provide data to open-data portal. Model lighthouse solutions: U8.

Business mc	odel canvas for the Sm	art solutions in	ncluded in the Replication Plan_GDAN	ISK			
Sector (SIP sectors)	Smart Solution (Name and relation to lighthouse solutions)	Key Partnership	Key Activities	Key Resources (Physical and human)	Value Proposition (Added value for the city)	User Relationships (Involvement and awareness of citizens and businesses)	Key End Users (Main beneficiaries)
ш	GDA1 - RES-ready urban energy management system - R8, R10	SMEs (ICT sector), PICTEC	Deployment of RES-ready solution that enables integration of PV panels and/or wind turbines, energy delivery, storage, and grid interfacing, including platform to integrate CPSs, telemetry, and telematics.	expertise on loT architectures, smart technologies offered by local industry	CO2 reduction, reduced energy costs	promotion of RES, offering interfaces for energy-data exchange with other parties	citizens of Gdansk, city authorities and city departments, ICT sector (application/system developers)
ш	GDA2 - Advanced energy management and integration system for public school building - R5, G4, U1	EDF, GPEC, Schneider- Electric, SMEs	Refurbishment and modernization of a public school building, including BEMS, employment of RES, energy-storage, energy-grid integration, ICT platform to integrate CPSs in energy domain.	EDF and Schneider- Electric solutions	CO2 reduction, reduced energy costs	demonstration of RES- focused technology to increase the uptake of similar solutions in public buildings	public education system, citizens, pupils, teaching staff
ш	GDA3 - Refurbishment, modernization, and ICT for buildings in Lastadia street - U4, U1, G4, R5	GPEC, GDMEL	Deployment of smart building technologies, including energy management system and building automation; integration with RES, energy- storage and energy-grid integration.	GPEC heating technology, GDMEL expertise	CO2 reduction, reduced energy costs	demonstration of state-of- the-art solution in smart building domain, promotion of RES for wider uptake of proposed technological solutions	citizens (Downtown inhabitants), industry, public administration
ш	GDA4 - Sewage-heat recovery for bicycle- path defrosting - R2, R4	GIWK, GPEC	Deployment of sewer-heat recovery solutions (distributed sewer collectors and heat recovery technology) that will be used for bicycle-path thawing during winter season.	GDMEL and GIWK expertise	increased comfort of travelling in winter season, increased road safety, CO2 reduction (through private care use reduction)	communication campaign to educate citizens and align the investment with Gdansk bicycle-policy	citizens (cyclists)
Σ	GDA5 - EV recharging points - U6, G5	Energa	Deployment of 10 FEV recharging points, including ICT integration and employment of RES with complementary energy- storage. Recharging points integrated with street lighting.	low-cost charging devices available on the market	CO2 reduction	raising proactive attitude of citizens towards low- carbon economy; education of citizens regarding of e-scooters and e-bikes; wider uptake of EV mobility	citizens (FEV users), public administration
_	GDA6 - Geographic Information System for heat, electricity, and water network - R9. G7	Energa, GPEC, GIWK, SMEs (ICT sector)	Implementation of GIS technology for heat, electricity, and water networks together with decision-support and planning tools	ICT department staff, already existing urban GIS datasets	access to geospatial information for business.	training programmes and organizational changes to use GIS for evidence-based decision making in city	citizens, municipal departments, municipal companies, business

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RUGGEDISED

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SCC-1-2016		RUGGEI	DISED CALL IDENTIFIER: H	2020-SCC-2016-20	17 O Asso	ciated with document Ref. A	.res(2016)5910251 - 13/10
Sector (Na (SIP (Na sectors)	Smart Solution ame and relation to lighthouse solutions)	Key Partnership	Key Activities	Key Resources (Physical and human)	Value Proposition (Added value for the city)	User Relationships (Involvement and awareness of citizens and businesses)	Key End Users (Main beneficiaries)
					citizens, administration; decision and planning support	departments	
I GD ^A stan cons buik	7 – Open-data dards for energy umption itoring in public dings - U8	SMEs (ICT sector), research and technology organizations	Exposure of public data-sets with the use of ACCUS platform as a gateway to integrate energy systems and provide data to open-data portal.	ICT department staff, expertise of PICTEC, ACCUS platform, CKAN portal	access to wide range of public data for monitoring; growth of smart city services	communication activities to reach stakeholders: citizens and businesses that will exploit the data	citizens, public administration, ICT sector
Other relevant sr Sector	nart solutions, no Smart solution	ot included ir	the Replication Plan_GDANSK				
ICT	ACCUS platform	t vių	Participation in the FP7/ARTEMIS research an operating system. Involvement in subsequent R&D project to ma Deployment of ACCUS ICP platform to integra distributed and evolving cyber-physical systen	d development proje ature existing technol te urban systems (AC ns and IoT solutions).	ct in order to provide logy. :CUS platform is dedi	e end-user requirements for A cated as integration and coord	CCUS smart city dination middleware for
ICT	Open data stano	lards 2. 2. 2. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3.	Development of CKAN platform as a place to g Access to open data for citizens and businesse Every city spending published daily on a webs All requests for public information and replies New standards for public procurements – new	gather and publish cit es to stimulate growtl ite. : published on websit v IT solutions for the	y data. 1 of bottom-up city s e. city should fulfil oper	mart services and ICT tools. Thess standards.	
Ŀ	Cooperation wit hacktivists	ч ; ;	Support for the Code of Poland initiative – enucity. Applications for monitoring traffic, real-time b	couraging the use of (ous timetables were c	city open data to creater currents of the creater of the creater of the current o	ate applications for improving rrently under development.	quality of life in the
ICT	 City applica better use c resources 	tion for 1. of city 2.	Gdansk has already created two applications. Wyrzuc.to (Throwlt Away) – real time data on New applications, improvements for it are un	Bank of trees – reside garbage collection. der development, like	ents can pinpoint on e an online survey to	a Google map where new tree show where new benches sho	es should be planted. Juid be placed.
Mobility	3. System of c routes (STe	ycle 1. R) 2.	Document which went through an extended p Development of bike routes, bicycle parkings bicycle parkings at each new investment.	process of public cons and better intra-distr	ultations (640 amen ict conections. Traffi	dments were proposed). c-calmed zones and legal oblig	ation for building
Mobility	3. The Bike Au	ldit 1. 2.	Based on the BYPAD methodology. First such a document in Poland and a backgro	ound for Gdansk's act	ion since 2010.		
Mobility	3. Tristar	-i -2, w,	Tristar is an Intelligent Transportation System Project was a part of Gdansk 2015 Developme Tristar project implements the Directive 2010, deployment of Intelligent Transport Systems i	installed in entire Tri ent Strategy. /40/EU of the Europe n the field of road tra	city agglomeration, i an Parliament and o msoort and for interf	.e. in Gdansk, Gdynia and Sopi f the Council of 7 July 2010 on faces with other modes of trar	ot. the framework for the isoort.

1. "Tristar 2.0" is the working name for the activities that will expand Tristar functionalities and territory.

4. Tristar 2.0

Mobility

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Noise, air pollution monitoring (including CO2 emission measurement), dynamic passenger information system, real-time traffic and public transport data, mobile applications, open APIs, business intelligence solution are contained under Tristar 2.0 label. *.*;

Investment Plan_GDANSK

Smart Solution	Estimated Cost	Funding Source and Scheme	Funding Timeline
RES-ready urban energy management system	TBD	investment in planning	TBD
Advanced energy management and	0.8 million EUR	Interreg Baltic Sea Region 2014-2020	up to 2021 (refurbishment); beyond 2021 (ICT,
integration system for public school building		(photovoltaics), public-private partnership (EDF, Schneider-Electric), Integrated Territorial Investments (ZIT = 60%), own investment (Gdansk)	integration, RES)
Refurbishment. modernization. and ICT for	10 million FUR	Integrated Territorial Investments (ZIT) and	up to 2020 (refurbishment and construction):
buildings in Lastadia street		Gdansk Drainage (GDMEL)	beyond 2021 (ICT, integration, RES)
Waste-heat recovery for bicycle-path	TBD	Gdansk Water and Sewers Infrastructure	TBD
defrosting		(GIWK), EU funding	
FEV recharging points	TBD	investment in planning	TBD
Geographic Information System for heat,	4–5 million EUR	investment in planning	TBD
electricity, and water network			
Open data standards for energy consumption monitoring in public buildings	TBD	investment in planning	TBD

Replication Roadmap_GDANSK

	her phases	4	٩	4	A	A	4	4	
	Deployment Ot	2022+ N//	2020 (refurbishment and construction works); 2022+ (ICT-RES innovations)	2018-2019 (refurbishment and N// construction works); 2022+ (ICT-RES innovations)	2022+ N//	2022+ N//	2022+ N//	2022+ N//	
	Procurement	2020-2021	2019 (refurbishment and construction works); 2021 (ICT-RES innovations)	2017 (refurbishment and construction works); 2021 (ICT-RES innovations)	2021	2021	2021	2021	
	Design	2019-2020	2018 (refurbishment and construction works); 2020 (ICT-RES innovations)	2016 (refurbishment and construction works); 2020 (ICT-RES innovations)	2020	2020	2020	2020	
NCNING UNAULIAP AUAINA	Smart Solution	RES-ready urban energy management system	Advanced energy management and integration system for public school building	Refurbishment, modernization, and ICT for buildings in Lastadia street	Sewage-heat recovery for bicycle- path defrosting	EV recharging points	Geographic Information System for heat, electricity, and water network	Open data standards for energy consumption monitoring in public buildings	

11.2.5 Integration and Long-Term Sustainability of the Smart Solutions

The programming period in Gdansk ends in 2023. Beyond that date new operational programmes will be defined in order to implement the general strategy of the city by 2030 (*Gdańsk 2030 Plus Development Strategy*).

To that end Gdansk will involve "smart city governing group" in the work on the operational programmes to in order to guarantee that the policy of Gdansk with regard to ICT-mobility-energy policy will not be altered and will be continuously implemented beyond 2023.
11.3 F.3 PARMA – Replication and Investment Plan

11.3.1 City Vision

The City of Parma has the vision to become more *attractive, sustainable, inclusive, harmonious*. The smart city vision is key to accelerate the city's sustainability and innovation.

This vision is outlined in the documents "Balance on the first half of the term of office" (*Bilancio di metà mandato*), "Programme of the term of office" and in the "Single Programming Documents".

The SPD, in particular, identifies the policies, the strategies and the planning guidelines to be implemented during the term of office of the Administration, recognises their possible medium and long term impacts; it also takes into account the regulatory framework and the objectives of the public budgetary policy.

These documents, officially approved, are available in the City website (<u>www.comune.parma.it</u>).

The SPD defines operative and sectorial objectives that decline the four key words of the City vision.

The following Replication and Investment Plan is relevant and coherent with these objectives, especially those relevant to the *sustainable city*.

To implement its vision, Parma signed the Covenant of Mayors (2013) and the Mayors Adapt Initiative (2014); the SEAP was adopted in 2014, in 2015 it was ranked the best Italian SEAP (A+COM, Italian Climate Alliance); the SUMP is under preparation and will be completed by the end of 2016 together with various actions to increase modal split; the City has a zero waste strategy; in 2015 the new energy regulation of the city has been issued to increase energy efficiency and the use of RES; the new policy and plan for urban planning and regeneration protects and promote the city's environmental integrity and cultural identity; and finally, the City participates to EU funded projects to increase its knowledge and expertise on innovation.

Parma ambition in the RUGGEDISED project:

RUGGEDISED is regarded not just as an opportunity to learn how to become smart city, but rather as the opportunity to mobilize knowledge, investment, policies and people for the implementation of a smarter city. Thanks to the ground-breaking activities the project will set in motion, Parma expects to be at once a model replicator and an inspirational example for other Italian and European mid-size cities.

Importantly, by working with the other RUGGEDISED cities, Parma intends to bring about a decisive change in the behaviour of citizens, in view of a more conscious and smart use of energy and mobility. This will be attained by integrating the knowledge and the experience gained in RUGGEDISED with a number of other local and European projects whose common goal is to aggregate citizens and stakeholders around the notion that sustainability is indeed a *collective commodity*.

Lastly, in times of severely shrinking public budgets, Parma's ambition is to use RUGGEDISED as a springboard to build stronger links and cooperation with both local and international stakeholders from the research and industrial world, in order to trigger investments in the local economy, consolidate markets and boost employment.

11.3.2 Replication and Investment Plan

11.3.3 Replication Area

Parma University Campus is the scientific centre of the University of Parma. It is an area of about 77 hectares located in the south of the city, with several buildings for teaching and scientific research. It covers an area of 108.900 sq.m. of useful area and 7.000 users. The development of the Campus

A strategic and innovative project, called Mastercampus, has been developed for the regeneration of the area. The project sees the area as a model district for the experimentation of innovative and integrated solutions to be later extended to other areas of the city. It currently includes 35 projects of 16 research departments in seven main thematic areas: energy management, environment, innovative construction, ICT, green economy, wellbeing health and lifestyle, architectural and urban forms, liveability and sociality. The development and regeneration plan of the Campus foresees an increase of 72% of the sq.m. of useful area, the increase of 100% of users – students, teaching and administrative staff, users of sport facilities - (from 7.000 users to 12.000 users and 2.000 residents).

The heated volume is about 300.000 m³ and every day more than 7.000 people live, study and work there: they are not only University employees, teachers, researchers and students, but also citizens that use the many sport facilities, recreational and shopping facilities located in the area.

The Campus energy consumptions are mainly due to building heating and cooling, domestic hot water, indoor and outdoor lighting. The whole buildings are currently served by a district heating/cooling system, which is

connected to a thermal power plant (methane gas boilers) and to cooling machines for air conditioning.



Fig. 1: City map overview (left) and University Campus (right)

11.3.4 Smart Solutions

The Ruggedized Smart Solutions that the City of Parma will adopt aim at creating a smart district with an integrated management of energy efficiency, sustainable mobility and ICT. The smart city solutions to implement are the following:

- P1: New plant for district heating connection Connected to U3, G1.
- P2: Energy management system Connected to R8.
- P3: Solar PV and supply of energy to EV charging and battery infrastructure Connected to G2, G5.
- P4: Intelligent building control Connected to U4.
- P5: E-Mobility Planning Software Connected to R7.
- P6: E-Charging Hubs E-vehicle charging infrastructures Connected to U6, G5.
- P7: Smart Waste Management Connected to R13.
- P8: Creation of a query based geo-spatial Data Based Decision Platform Connected to G7.
- P9: Smart Open Data city Decision platform Connected to U8.
- P10: Smart public lighting Connected to G6, R11

Every replicating action is described in the table below.

Key End Users (Main beneficiaries)	STEM students, University and Municipal employees, citizens	STEM students, University and Municipal employees, citizens	STEM students, University and Municipal employees, citizens	STEM students, University and Municipal employees, citizens
User Relationships (Involvement and awareness of citizens and businesses)	Apps, real-time information boards, workshops, conferences (also for other Municipalities) to demonstrate the feasibility and value for the city	Apps, real-time information boards, workshops, conferences (also for other Municipalities), to demonstrate and uptake smart solutions	Apps, real-time information boards, workshops, conferences (also for other Municipalities), promotion of RES	Apps, real-time information boards, workshops, conferences (also for other Municipalities),
Value Proposition (Added value for the city)	Reduction of energy consumption and costs, Promotion of RES	The use of smart meters reduce energy consumption, optimize energy grids and increase the knowledge and awareness of citizens behavior.	Promotion of RES and uptake in other areas. Develop a smart and sustainable identity for the University Campus, which can be replicated in the city.	The use of an intelligent control system for the internal climate can be optimized and developed in the building sector of the city.
Key Resources (Physical and human)	University Technical Office, Municipal Energy Division. Existing buildings and energy grids (Municipality and University).	University Technical Office, Municipal Energy Division. Existing buildings and energy grids (Municipality and University).	University Technical Office, Municipal Energy and Mobility Division. EV recharging network and energy grids (Municipality and University).	University Technical Office, Municipal Energy Division. Existing buildings and energy grids (Municipality and University).
Key Activities	New plant (a trigeneration plant with a capacity of 1000 kWe) for distributed energy generation will be implemented in the thermal power station serving the district heating and cooling of the University Campus: in order to optimize heating loads a thermal storage will be also implemented.	The demand and supply of energy of all the buildings (35 buildings) will provide insight by using smart meters and the BIM-model. These data in energy flows together with the introduction of the energy management system will ensure that the energy-exchange between the assets will be made totally efficient.	Surplus electric energy from PV systems will serve storage batteries to EV chargers. 700 kWp of PV panels are being installed. It is considered a battery with electric storage equal to 2000 kWh.	An intelligent control system for the internal climate will be installed in buildings at the University Campus: this will be a continuous monitoring system allowing the optimization of the indoor climate depending on the weather and uses, and then reducing energy consumptions. Moreover, in order to raise awareness and incentivize users to save energy, digital real-time information, statistics on climate impact and suggestions to put the homes in "saving mode" will be
Key Partnership	University of Parma, City of Parma.	University of Parma, City of Parma.	University, City of Parma.	University, City of Parma.
Smart Solution (Name and relation to lighthouse solutions)	P1 - New plant for district heating connection - U3, G1	P2 - Energy management system - R8	P3 - Solar PV and supply of energy to EV charging and battery infrastructure - G2, G5	P4 - Intelligent building control - U4
Sector (SIP sectors)	ω	ω	ω	ш

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Business model canvas for the Smart solutions included in the Replication Plan PARMA

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CC-1-2016		RUGGE	EDISED CALL IDENTIFIER: H2020-SC	CC-2016-2017	 Associated with doc 	ument Ref. Ares(2016)591	0251 - 13/10/2016
Sector (SIP sectors)	Smart Solution (Name and relation to lighthouse solutions)	Key Partnership	Key Activities	Key Resources (Physical and human)	Value Proposition (Added value for the city)	User Relationships (Involvement and awareness of citizens and businesses)	Key End Users (Main beneficiaries)
			showed to the end users.				
Σ	P5 - E-Mobility Planning Software - R7	TEP SpA (local public transport society), SMTP SpA (public transport planning and control society)	Renewal of the night services management software called "Prontobus" (a bus service 'on demand') and the school bus service called "Happy Bus". The software in use is obsolete. We need to improve it and make it smart by collecting all the information on traffic and mobility and re-plan the services in order to make them more efficient, reduce costs, increase users' satisfaction, increase users numbers. Foreseen integration with the general software of the local transport system and the future replacements of vehicles with 'zero emission vehicles'.	Software for public transport, management Engineers, ITS technicians and engineers, management experts	Emissions reduction, energy costs reduction, traffic congestion reduction, education to sustainable mobility to families and students	Communication plan for citizens, families, schools, youth	Primary and secondary school students and families, citizens
Σ	P6 - E-Charging Hubs - E-vehicle charging infrastructures- U6, G5	University, AEMD SpA (electric energy supplier company)	In order to encourage the use of electric mobility, we plan to realize additional hubs for E-vehicle charging suitable for car sharing, bike sharing, electric cars, electric bikes powered by renewable energy sources. These E-charging hubs will be super fast and placed at special spots, developing the business case for concentrated deployment of EV chargers, connecting the charging hubs to renewable energy and battery storage. The main aim of this measure is to provide smart energy to recharge electric vehicles from renewable sources and so to implement a model in a smart city area in terms of energy self-sufficiency in relation to the charging of electric vehicles which can then be replicated in other districts. We plan to implement 5 hubs in the Campus (phase I) and aprox 10 hubs in the city (phase II).	E-vehicle charging platforms, engineers	Emissions reduction, Reduced energy costs, Increased modal split	Communication plan for citizens and businesses, Apps for the reservation of charging places	Citizens, business companies
Σ	P7 - Smart Waste Management - R13	IREN (public utility)	Monitoring system of the degree of filling and optimize the route of the collection vehicles. In Parma the waste collection is based on the door to door system. This solution will be applied on the collection of the glass banks in the Campus and in the nearby district Montanara district (80 glass banks) as a pilot phase; if the results are good, it is expected to be extended to the whole city (1.300 glass banks). We estimate a		Reduction of traffic for waste collection, Reduction of traffic noise due to heavy waste vehicles, Reduction of emissions, Increased efficiency of waste collection,	Communication activities to engage citizens and companies and show results and impacts	Citizens, enterprises, SMEs

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10251 - 13/10/2016	Key End Users (Main beneficiaries)		City decision makers, city technicians, decision makers and technicians of University and other stakeholders, students, companies.	City decision makers, city technicians, decision makers and
ument Ref. Ares(2016)59	User Relationships (Involvement and awareness of citizens and businesses)		Communication plans	Communication plans, developing web applications and apps for devices.
Associated with doc	Value Proposition (Added value for the city)	Monitoring and analysis of glass waste production will allow a better positioning of the glass banks in the districts. Development of a service model to be used for events (sports, concerts etc.) that produce a high number of waste.	Collect data in order to develop new digital services that improve quality of life in the city	Data sets available
CC-2016-2017	Key Resources (Physical and human)		Data network, server farm, system engineers, db administrator	Analysts, system engineers, db administrator
EDISED CALL IDENTIFIER: H2020-S0	Key Activities	reduction of at least 20% of the numbers of collections, which equals to: reduction of 12.000 km/year, 6.000 lt. of fuel/year, reduction of PM10 (3.276.000 mg), PM2,5 (2.676.000), NOX (77.292.000 mg), CO2 (8.016.000 mg).	An integrated system of data monitoring and analysis will be assembled and configured from multiple systems and environmental and energy monitoring devices. The system will produce multiple analyzes and "accommodate" all modeling calculations, and will provide users with a decision support tool for environment and energy planning and control. The two main elements of this system are: the DataWarehouse, that will provide all the services for data management and for queries with both graphic and alphanumeric outputs; the Cartographic site, which will allow to view the road network, the location of the data collection systems and the processed data represented according to different topics. The system will be set up so that it can be used for future developments of different types of data, and it can integrate new functional modules of the mobility- environment system of Parma.	The solution will complement P8-1, by integrating collected data from other areas such as buildings, mobile devices and other "objects" that communicate with the territory. It will implement the Open Portal and App that will
RUGGI	Key Partnership		University, BT ENIA TLC, IREN, TEP SpA, ARPAE,	University
	Smart Solution (Name and relation to lighthouse solutions)		P8 - Creation of a query based geo-spatial 'Data Based Decision Platform' - G7	P9 - Smart Open Data city Decision platform – U8
SCC-1-2016	Sector (SIP sectors)		-	-

RUGGEDISED	
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Key End Users (Main beneficiaries)	technicians of University and other stakeholders, students, citizens, companies.	
User Relationships (Involvement and awareness of citizens and businesses)		
Value Proposition (Added value for the city)		
Key Resources (Physical and human)		
Key Activities	allow users to access data and to use them in an integrated way.	The refurbishment of the public lighting city network will be implemented in the next years, public procurement is in progress. Target for this action is to improve the efficiency of the street lighting system in order to reduce consumptions of at least 60%, and to change 75% of the public street lighting lamps with LED systems, with configuration for installation in the future of intelligent sensors to adjust lighting intensities, to measure air pollutions, with a centralized management system. The challenge is to make the system smart and develop the necessary intelligence and integration. There is also a challenge for the development of a business model for the participation and financing of private.
Key Partnership		
Smart Solution (Name and relation to lighthouse solutions)		P10 - Smart public lighting -G6, R11
Sector (SIP sectors)		-

Other relevant smart solutions, not included in the Replication Plan_PARMA

Key Activities and Value Proposition	This action aims at reducing energy consumptions of condominiums (residential apartment complex) esp. those built in the 60s and 70s (1.000 of existing 5.000 buildings). In order to achieve this the Municipality of Parma has signed a protocol with 5 Energy Service Companies (ESCo), which will provide energy audits, create a local business network with building companies, designers, artisans, banks. The technical economic offer between ESCos and Condominiums will be based on an Energy Performance Contract (EPC). A monitoring system will be implemented in order to measure savings achieved.	Development of the existing district heating that will increase the served volume up to about 6,1 m ³ , from the current 4,9 million m ³ . The system is served from the municipal refuse to energy incinerator. Moreover, in every building served by the district heating, temperature control systems and smart consumption	
Smart Solution (Name)	Sustainable condominiun	District heating development and	
Sector (SIP sectors)	ш	ш	

SCC-1-2016		RUGGEDISED	CALL IDENTIFIER: H2020-SCC-2016-2017	ociated with document Ref. Ares(2016)5910251 - 13/10/2016
Sector (SIP sectors)	Smart Solution (Name)		Key Activities and Value Proposi	ion
	measuring consumption systems	meters will be installed.		
ш	Infinite Solutions - INnovative FINancIng for Local SusTainable Energy Solutions	Intelligent Energy Europe project tha is setting up up a revolving funds for	at is developing innovative financing instruments to support er private buildings; if successful it can support the Replication	nergy-efficiency upgrades in public and private buildings. Parma and Investment Plan.
Σ	Electric Mobility	The City of Parma and the Emilia Roi agreement protocol finalized to plai Region Project called "Mi Muc In addition, the regional project "Fre purchase 18 electric vehicles to impl	magna Region signed on 01/03/2013 (Prot Gen. 39029) with nning initiatives aimed to promote and develop electric me ovo Elettrico"). This protocol involved the creation ee Carbon City-Mi Muovo Elettrico" (POR-financed by the El lement the municipal fleet.	ENEL Distribuzione SpA and AEM Distribuzione SpA (AEMD) an bility according to interoperability standards (Emilia Romagna of 11 car charging infrastructures on public areas. DF 2007-2013 EU funds) allowed the Municipality of Parma to
Σ	Sustainable Mobility Plan and its objectives	The SUMP is in progress and will be existing SEAP and with ICT to suppor	ready by the end of 2016. Among its key aims are the integra rt innovative and smart city solutions.	tion of sustainable mobility with energy efficiency and the
Σ	Freight Tails - delivering Tailored Approaches for Innovative Logistics Solutions	URBACT III Action planning network an integrated action (IAP) plan to mi out quickly enough to adequately su project aims is therefore to develop stimulating the low carbon urban fre being implemented and we explore	project. It is developing an integrated and participatory appr ake logistic more sustainable. The implementation of sustair pport achievement of EU 2020 objectives and particularly th o tailored freight management policies, whilst reducing the eight sector. The IAP will be linked to the SUMP and include possible synergies with RUGGEDISED project and smart solui	ach to the hot topic of urban logistic. By 2018 the city will have able and smart freight distribution solutions is not being rolled e accompanying 20/20/20 climate/energy headline targets. The carbon emissions associated with urban freight transport, and i in the our smart city vision. After 2018 the IAP is expected to ions for logistics.
-	Regional data centre	One of the three regional data cent reliability and safety and at lower co recovery, backup, business continuit	ter is under preparation in the premises of the Municipality osts than those of the market. Available to public administra ty.	. Natively connected to the fiber network, with high levels of ions and private organisations for computing, storage, disaster
Investment Pl	an_PARMA			
Smart Soluti	on Estimated	Fu Funding source and sche	unding Source and Scheme อากอ (อ.ศ. ภาเปม่า: การ่างราค DD รากงหรือการรากจ อคร)]	Funding Timeline (Date of funding availability)
P1	1.500.000€		Public, Private, PP, ERDF	2019
P2	150.000€		Public, Private, PP, ERDF	2019
P3	1.000.000€		Public, Private, PP, ERDF	2019
P4	250.000€		Public, Private, PP, ERDF	2019
P5	150.000€		Public, Private, PP, ERDF	2020
P6	500.000€		Public, Private, PP, ERDF	2021
P7	30.000 € (pilot phase); 380.00 € (second phase: roll out to the whole city)		Private, EU funds	2021

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Replication Roadmap_PARMA

				_				_					
		Other Phases						2022	2021	2021	2022	2022	2021
		Deployment		2022	2022	2022	2022	2021	2021	2021	2021	2021	2022
		Procurement		2020	2020	2020	2020	2021	2020	2020	2020	2020	2022
1	Design	(Business model, technical	requirements, other)	2018	2018	2019	2019	2020	2020	2020	2020	2020	2021
		Smart Solution		P1	P2	P3	P4	P5	P6	P7	P8	6d	P10

11.3.5 Integration and Long-Term Sustainability of the Smart Solutions

The package of smart solutions has been selected to meet the ambition of Parma to become a smart city in a few years. The guiding principles in setting this package have been: the feasibility of the solutions in the local context of Parma, the replicability in other city districts, the integration of the solutions to overcome the usual sectorial approach.

The replication plan will enhance the integration between energy efficiency, renewable energies, energy storage, monitoring consumptions, sustainable mobility and data flows. In particular, P8 and P9 refer to the creation of a unique infrastructure of centralization and data management to be integrated for analysis, processing, simulations on energy consumption, traffic. The Plan considers the integration of P2, P4 and P5 in the infrastructure; further development and integration will be analysed during the course of the project.

The solutions will also be connected to existing or already planned projects and integrated into city existing plans and in plans under preparation (SEAP, SUMP, Mastercampus, Sustainable Condominiums etc. listed in the above table "Other relevant smart solutions, not included in the Replication Plan"), which will support the sustainability of the Plan.

The expected results are the following:

- acquire a full range of organisational and technical competences on smart solutions
- optimize thermal and electric process, thanks to the monitoring of energy consumptions which allows to collect, process, store data relating to energy flows;
- reduce thermal and electric consumption by improving the efficiency of buildings, thermal plants and public lighting;
- using surplus PV electric energy in storage systems for EV;
- reduce traffic impacts and people daily flows, increase modal split with the introduction of advanced solutions: redesign of parking places, EV charger points (integrated into the energy network) and appropriate tools to promote car-sharing, car-pooling and bike-sharing;
- mobilize and engage the local actors in the smart city roadmap, including investors
- contribute to bring about a decisive change in the mobility of citizens, for a more conscious and smart mobility
- raise awareness and freedom of choice for more sustainable mobility, and particularly walking and cycling.

12Annex G List of Abbreviations

Short	Explanation	Short	Explanation
Арр	Application	LED	Light Emitting Diode
BREEAM	Building Research Establishment	Mton	Megaton
	Environmental Assessment Methodology		
C0 ₂	Carbon Dioxide	MWh	Mega Watt hour
DC	Direct Current	NOx	mono-nitrogen oxides NO and NO2
е	electric	PC	Project Coordiantor
EIP		PPP	People Planet Profit
ERDF	European Regional Development Fund	PV	Photovoltaics
ESCO	Energy Service Company	R&D	Research and Development
HVAC	Heating, Ventilation, and Air Conditioning	RES	Renewable Energy Sources
ICT	Information and Communication Technology	ROI	Return on Investment
BIM	Building Information Model	SCC	Smart Cities and Communities
СНР	combined heat and power	SCIS	Smart Cities Information System
CIVITAS	CIty-VITAlity-Sustainability	SEAP	Sustainable Energy Action Plans
CONCERTO	See SCIS	SME	Small to Medium Enterprice
EC	European Commission	TRL	Technology readiness level
ESF	European Social Fund	WP	Work Package
EU	European Union		
EV	Electric Vehicle		
GA	General Assembly		
GWh	Giga Watt hour		
IoT	Internet of Things		

					Ш	TIMATED B	UDGET FOR	THE ACTIO	N (page 1 of :	3)		1			
				Estimated eli	igible ¹ costs (per buc	lget category)					EU contribution		PV	ditional information	
	A. Direct personne	el costs			B. Direct costs of subcontracting	[C. Direct costs of fin. support]	D. Other direct costs	E. Indirect costs ²	Total costs	Reimbursement rate %	Maximum EU contribution ³	Maximum grant amount ⁴	Information for indirect costs	Information for auditors	Other information:
	A.1 Employees (o A.2 Natural persor contract A.3 Secondel pers [A.6 Personnel for research infrastrue	r equivalent) us under direct providing access to ture)	A 4 SME owners v A 5 Boneficiaries t persons without sa	vithout salary hat are natural lary			D.1 Travel D.2 Equipment D.3 Other goods and services D.4 Costs of large research infrastructure						Estimated costs of in-kind contributions not used on premises	Declaration of costs under Point D.4	Estimated costs of beneficiaries/ linked third parties not receiving EU funding
Form of costs ⁶	Actual	Unit ⁷	Un	nit ⁸	Actual	Actual	Actual	Flat-rate ⁹							
								25%							
	(a)	Total (b)	No hours	Total (c)	(p)	(6)	(J)	(g)=0.25x ((a)+(b)+ (c)+(f) +[(h1)+(h2)]- (m))	(i)= (a)+(b)+(c)+ (d)+(c)+(f)+ (g)+(h1)+(h2)+(h3)	9	(k)	e	(ш)	Yes/No	
1. ROT	1087092.00	0.00	0	0:00	0:00	0.00	296894.00	345996.50	1729982.50	100.00	1729982.50	1729982.50	0.00	No	
2. UME	674765.00	0.00	0	0.00	625000.00	000	78769.00	188383.50	1566917.50	100.00	1566917.50	1566917.50	0.00	No	
3. GCC	791765.00	0.00	0	0.00	150000.00	0.00	1063694.00	463864.75	2469323.75	100.00	2469323.75	2469323.75	0.00	No	
4. SP	636576.00	00.00	0	0:00	0:00	0:00	40300.00	169219.00	846095.00	100.00	846095.00	846095.00	0.00	No	
5. ISINNOVA	438851.00	00.00	0	00.00	00.00	000	50309.00	122290.00	611450.00	100.00	611450.00	611450.00	0.00	No	
6. AIT	815832.00	0.00	0	0.00	0.00	00.0	54005.00	217459.25	1087296.25	100.00	1087296.25	1087296.25	00.00	No	
7. TNO	474318.00	00.00	0	0.00	00.00	000	31050.00	126342.00	631710.00	100.00	631710.00	631710.00	0.00	No	
8. ICLEI	514600.00	00.00	0	0.00	00.00	0.00	105300.00	154975.00	774875.00	100.00	774875.00	774875.00	0.00	No	
9. EUR	422400.00	0.00	0	0.00	0.00	000	19650.00	110512.50	552562.50	100.00	552562.50	552562.50	0.00	No	
10. UU	289460.00	0.00	0	0.00	60000.00	0.00	113175.00	100658.75	563293.75	100.00	563293.75	563293.75	0.00	No	
11. US	369152.00	0.00	0	0.00	0.00	00.0	18725.00	96969.25	484846.25	100.00	484846.25	484846.25	0.00	No	
12. UB	73640.00	0.00	0	0.00	00.00	0.00	001069	20135.25	100676.25	100.00	100676.25	100676.25	0.00	No	
13. Brno	206901.00	0.00	0	0.00	00.00	0.00	33615.00	60129.00	300645.00	100.00	300645.00	300645.00	0.00	No	
14. Parma	240948.00	00.00	0	0.00	30000.00	0.00	36615.00	69390.75	376953.75	100.00	376953.75	376953.75	0.00	No	
15. Gdansk	189862.00	00.00	0	0.00	00:00	0.00	33615.00	55869.25	279346.25	100.00	279346.25	279346.25	0.00	No	
16. BN	330208.00	0.00	0	0.00	25000.00	0.00	520400.00	212652.00	1313260.00	70.00	919282.00	919282.00	0.00	No	
17. RET	250670.00	0.00	0	0.00	0.00	00.0	220400.00	117767.50	588837.50	70.00	412186.25	412186.25	0.00	No	
18. ENE	186212.00	0.00	0	0.00	0.00	000	7400.00	48403.00	242015.00	70.00	169410.50	169410.50	0.00	No	
19. KPN	226265.00	0.00	0	0.00	00.00	0.00	150400.00	94166.25	47083125	70.00	329581.88	329581.88	0.00	No	
20. AHAB	180670.00	00:00	0	0.00	310000.00	0.00	223325.00	100998.75	814993.75	70.00	570495.63	570495.63	0.00	No	
21. VCC	215670.00	0.00	0	0.00	9000006	0.00	44025.00	64923.75	414618.75	100.00	414618.75	414618.75	0.00	No	
22. UEAB	264670.00	0.00	0	0.00	60000.00	0.00	26325.00	72748.75	423743.75	70.00	296620.63	296620.63	0.00	No	
23. UPAB	117670.00	00:00	0	0.00	0.00	0.00	11325.00	32248.75	161243.75	70.00	112870.63	112870.63	0.00	No	
24. TS	70860.00	00.00	0	0.00	00.00	0.00	10400.00	20315.00	101575.00	100.00	101575.00	101575.00	0.00	No	
25. SPPS	282150.00	0.00	0	0.00	00:00	0.00	10400.00	73137.50	365687.50	70.00	255981.25	255981.25	0.00	No	
26. TCB	115864.00	00:00	0	0.00	0.00	0.00	10400.00	31566.00	157830.00	70.00	110481.00	110481.00	0.00	No	
27. SIE	435125.00	00.0	0	0.00	00.00	0.00	10400.00	111381.25	556906.25	70.00	389834.38	389834.38	0.00	No	
28. PIC	71550.00	0.00	0	0.00	0.00	0.00	6901.00	19612.75	98063.75	100.00	98063.75	98063.75	0.00	No	
29. UNR	346434.00	0.00	0	0.00	0.00	000	41500.00	96983.50	484917.50	70.00	339442.25	339442.25	0.00	No	

ESTIMATED BUDGET FOR THE ACTION (page 2 of 3)

				Estimated eli	gible ¹ costs (per bud	get category)					EU contribution		Y	Iditional information	
	A. Direct personne	il costs			B. Direct costs of	[C. Direct costs	D. Other direct	E. Indirect costs ²	Total costs	Reimbursement	Maximum EU	Maximum	Information for	Information	Other
					subcontracting	of fin. support]	costs			rate %	contribution ³	grant amount ⁴	indirect costs	for auditors	information:
	A. I Employees (o A.2 Natural persor contract A.3 Seconded pers [A.6 Personnel for research infrastrue	r equivalent) us under direct providing access to ture]	A 4 SME owners v A 5 Boneficiaries t persons without sal	vithout salary hat are natural lary			D.1 Travel D.2 D.2 D.3 Other goods and services D.4 Costs of large research infrastructure						Estimated costs of in-kind contributions not used on premises	Declaration of costs under Point D.4	Estimated costs of beneficiaries/ linked third parties not receiving EU funding
Form of costs ⁶	Actual	Unit ⁷	Un	nit ⁸	Actual	Actual	Actual	Flat-rate ⁹							
								25%							
	(a)	Total (b)	No hours	Total (c)	(p)	(e)	(j)	$\begin{array}{c} (g)=0,25x\\ ((a)+(b)+\\ (c)+(f)\\ +[(h1)+(h2)]-\\ (m))\end{array}$		Û	(k)	Ð	(ш)	Yes/No	
30. INF	95212.00	0.00	0	0.00	0.00	0.00	00.1069	25528.25	127641.25	70.00	89348.88	89.348.88	0.00	No	
31. FI	246480.00	0.00	0	0.00	0.00	0'00	107400.00	88470.00	442350.00	70.00	309645.00	309645.00	0.00	No	
32. WG	25800.00	0.00	0	0.00	157650.00	0.00	51468.00	19317.00	254235.00	100.00	254235.00	254235.00	0:00	No	
33. GIWK	59584.00	0.00	0	0.00	0.00	0.00	001069	16621.25	83106.25	70.00	58174.38	58174.38	0:00	No	
34. SI	62480.00	0.00	0	0.00	0.00	000	5550.00	17007.50	85037.50	100.00	85037.50	85037.50	0.00	No	
Total consortium	10809736.00	0:00		0.00	1732650.00	000	3454438.00	3566043.50	19562867.50		17692858.41	17692858.41	0.00		0.00

ESTIMATED BUDGET FOR THE ACTION (page 3 of 3)

(1) See Article 6 for the eligibility conditions
 (1) See Article 6 for the eligibility conditions
 (2) The entries for the operating grant (during the action's duration rannot declare indirect costs for the year(s)/reporting period(s) covered by the operating grant (during the action's duration cannot declare indirect costs for the year(s)/reporting period(s) covered by the operating grant (action 6 S.E.)
 (3) This is the heoretical amount of EU contribution that the system calculates automatically (by multiplying all the budgeted costs by the reinhursement rate). This there in amount '(that the Commission/Agency decided by the Commission/Agency for the year(s)/reporting period(s) covered by the operating grant amount '(that the Commission/Agency decided by the Commission/Agency for the variant amount of EU contribution that the system calculates automatically (by multiplying all the budgeted costs by the reinhursement rate). This is the heoretical amount of EU contribution that the system calculates automatically (by multiplying all the budgeted costs by the reinhursement rate). This there is a period of the commission/Agency for commission/Agency. Thornmaly the requested grant, but may be low:

 (3) This is the heoretical amount of EU contribution for ording trans-mational access to research ording trans-mational access to research infrastructure and costs for providing trans-mational access to research infrastructure and costs for clinical studies.
 (3) Entities 2.5 Additional information on the estimated buget for the details (units, costs per unit, estimated huger for the details (units, costs per unit, estimated buget for the details (units, costs per unit, estimated buget for the details (units, costs per unit, estimated buget for the details (units, costs per unit, estimated buget for the details (units, costs per unit, estimated buget for the details (units, costs per unit, estimated buget for the details (

ACCESSION FORM FOR BENEFICIARIES

UMEA KOMMUN (UME), 2120002627, established in SKOLGATAN 31A, UMEA 90184, Sweden, VAT number SE212000262701, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('2')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Jonas JONSSON with ECAS id njnssjon signed in the Participant Portal on 26/10/2016 at 11:59:03 (transaction id Sigld-58476zucB6HJYTO68pJ8FvkJAAtNNbKFPieNUQ9vOVF9mQZa0LQtbF0wLQ 0uyettlsS7ZHte7mLFGebxNOUnRvUwaSg-Jj71zxYb8yrkmoAceBIUCa-2qcKIztUb0uwTy4vyOAa8onoMpMDijhzmYTbzuKjKzJM). Timestamp by third party at Wed Oct 26 12:59:23 CEST 2016

ACCESSION FORM FOR BENEFICIARIES

GLASGOW CITY COUNCIL (GCC), established in 285 GEORGE STREET FINANCIAL SERVICES, GLASGOW G2 1DU, United Kingdom, VAT number GB653051560, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('3')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Martin MCCOLGAN with ECAS id ncolgmrt signed in the Participant Portal on 26/10/2016 at 10:42:19 (transaction id Sigld-56769-PHrQxykMOhDs5JgBG2hsK0OFS9mBltzwTAlvg2lhZRdlu15Do3mdXk yizULc3Y87LeuAszzVC7A43k4tmJmrhRS-JJ71zxYb8yrkmoAceBlUCasNizftv62EiXnxSWc2NBVmcveq9MVOhpQxJykNmwsD5). Timestamp by third party at Wed Oct 26 11:42:29 CEST 2016

ACCESSION FORM FOR BENEFICIARIES

SP SVERIGES TEKNISKA FORSKNINGSINSTITUT AB (SP) AB, 5564646874, established in BRINELLGATAN 4, BORAS 501 15, Sweden, VAT number SE556464687401, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('4')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

Margaret MCNAMEE with ECAS id nnameema signed in the Participant Portal on 26/10/2016 at 12:42:40 (transaction id Sigld-59149-7uq4tLU7BmjvWqFvM9WIAzvVdHff83UVabJRh2y3vg3uM27zvkoY8Uy Vq1tXzMzzPzqznZ6QPmjiZF3000FEAX6tW-Jj71zxY89yrkmoAceBIUCazw6mlv3CTD7mZemuJCQzRRBH0fdTvzhC0eh7H1zw2IwzG). Timestamp by third party at Wed Oct 26 13:43:04 CEST 2016

ACCESSION FORM FOR BENEFICIARIES

ISTITUTO DI STUDI PER L'INTEGRAZIONE DEI SISTEMI SC (ISINNOVA) SC, 344075/ CF00816470587, established in LARGO DEI LOMBARDI 4, ROMA 00186, Italy, VAT number IT00934601006, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('5')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

third party at Wed Nov 09 12:42:35 CET 2016

Mario GUALDI with ECAS id ngualdmo signed in the Participant Portal on 09/11/2016 at 12:41:57 (transaction id Sigld-22923-QE48ZqnyzOzuoLiyOtO3qxsvSJh5Z5uYEDIXNXzuOCwwdSKCYXGy49H MKMpSAJn3wQ4PuTQIL13wju2zd8VD2-PHsIUMVSXYCEbaUOEcOk1C-GzhYpuXEupv1MZUzwuxbxzvNR69Yah8T1nefx5AfUEeW). Timestamp by third partu ct

ACCESSION FORM FOR BENEFICIARIES

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY GMBH (AIT) GMBH, FN115980I, established in DONAU CITY STRASSE 1 TECH GATE VIENNA, WIEN 1220, Austria, VAT number ATU14703506, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('6')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM and the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any amendments to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

by third party at Mon Nov 07 11:58:31 CET 2016

Michael PARIK with ECAS id nparikmi signed in the Participant Portal on 07/11/2016 at 11:57:54 (transaction id Sigld-1282-MPgK1sqKFO8BD2zuGcGMw/9X/W4Wbox6M9gKkehyWM6jDmkuuMPDL PUn3eMD5USweJoGQlo19eASTcRq5Lbsj0-Jj71zxYB8yrSvqV41qJ28q-8m339miVAe6s99TNzVJbhyuoM5GZnBWVXRWXfrhzqmLm). Timestamp but blied north cet

ACCESSION FORM FOR BENEFICIARIES

NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO (TNO), 27376655, established in ANNA VAN BUERENPLEIN 1, DEN HAAG 2595 DA, Netherlands, VAT number NL002875718B01, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('7')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Leo KUSTERS with ECAS id nkusterl signed in the Participant Portal on 09/11/2016 at 11:48:37 (transaction id Sigld-21517-912EtFBWMyLWabqAPxXKoObzXS0UEqX7TII3vxu00x74jNgJf72lenbch RUWLw317dprSa5s8AtJRWUSPnybTO-PHSIUMVSXYCEbaUOEcOk1C-DCgFU6IMnuUBbSW5izu2dTFWRyRt7XMNaCFzL4tQoeaW). Timestamp by third party at Wed Nov 09 11:49:15 CET 2016

ACCESSION FORM FOR BENEFICIARIES

ICLEI EUROPEAN SECRETARIAT GMBH (ICLEI EUROPASEKRETARIAT GMBH)* (ICLEI) GMBH, HRB4188, established in Leopoldring 3, Freiburg 79098, Germany, VAT number DE153445986, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('8')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM and the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any amendments to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Wolfgang TEUBNER with ECAS id nteubnwg signed in the Participant Portal on 28/10/2016 at 15:40:39 (transaction id Sigld-12701-KCqiP1LaP2MwxCYnT2FuvTvNvX6hziRpRillguhrzRebDVWmWjyypJxqUL R00XG7siiJxzSRRUq55KiLzszqQjRm-PHsIUMVSXYCSODP6fnoRgS-NZ52PVy6WCpA7x9pD4p00JkWUNSzLtv8FzabtgkYEd5a). Timestamp by third party at Fri Oct 28 16:41:06 CEST 2016

ACCESSION FORM FOR BENEFICIARIES

ERASMUS UNIVERSITEIT **ROTTERDAM (EUR)**, 24495550, established in BURGEMEESTER OUDLAAN 50, ROTTERDAM 3062 PA, Netherlands, VAT number NL804735529B02, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('9')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM and the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any amendments to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Kristel BAELE with ECAS id ncvbeuvo signed in the Participant Portal on 09/11/2016 at 17:16:38 (transaction id Sigld-29856-pl3SFRJInYTVFTUJ498vER21xJ9chhmxQ5dahhcR6BsKB2xJAhTXBww7 wrFzV6GpPYIV95zH4qTcCStUcF0pn-PHsIUMVSXYCEbaUOEcOk1C-PYpKRQIyDVCEQfOQNXw0zhQqWtWJRBK6cygKzHjfTGqW). Timestamp by third party at Wed Nov 09 17:17:17 CET 2016

ACCESSION FORM FOR BENEFICIARIES

UMEA UNIVERSITET (UU), 2021002874, established in UNIVERSITETOMRADET, UMEA 901 87, Sweden, VAT number SE202100287401, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('10')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

Caroline SJÖBERG with ECAS id nsjoebca signed in the Participant Portal on 31/10/2016 at 08:51:43 (transaction id Sigld-1738-PNwhkXGBr8VOLkxBIZAUX0v7djeLzpnznGjk1zvPIL4L50uL9aWwTT3k C9QM5LyDTNzyD12woeoF4zQZ8CV7Gfh-Jj71zxYb8yrI8GmV4asVNatD86oXwXxvqATFBfJ7Pb6TUDxSTYzaiROrUm8oMiYZH). Timestamp by third party at Mon Oct 31 08:52:12 CET 2016

ACCESSION FORM FOR BENEFICIARIES

UNIVERSITY OF STRATHCLYDE (US), RC000670, established in Richmond Street 16, GLASGOW G1 1XQ, United Kingdom, VAT number GB261339762, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('11')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Martin GREGORY with ECAS id ngregoma signed in the Participant Portal on 17/11/2016 at 15:32:49 (transaction id Sigld-11199-QWkNcaj2MZfn3m6EyFpuBSiuOgObWzOmeDq7sEoCRq0NgWocRddnGj HfUtHwJ8al5jGektPpOzkHFrF1PpMMyT-PHsIUMVSXYC3y9Y47r60LWuVjiwG6UgRmyziHrQzzQWxE3tzczv2zICHcD1ALwqQOsG). Timestamp by third party at Thu Nov 17 15:33:36 CET 2016

ACCESSION FORM FOR BENEFICIARIES

VYSOKE UCENI TECHNICKE V BRNE (UB), 00216305, established in ANTONINSKA 548/1, BRNO STRED 601 90, Czech Republic, VAT number CZ00216305, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('12')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Petr STEPANEK with ECAS id nspanepe signed in the Participant Portal on 01/11/2016 at 13:41:28 (transaction id Sigld-11695-0HCv8VHrWGctzYwuKdb9TnllyFVnbzUrPuQw7EmiK0PaATEjmiwcyZ Ta6Rd9Do8G9SbshlgjZYIObkDeOxfilie-Jj71zxYb8yrl8GmV4asVNa-FDIzcJqxLHUS8m5nZ4HgvC6VRuRViVihPy8ou2tCkJ). Timestamp by third party at Tue Nov 01 13:41:55 CET 2016

ACCESSION FORM FOR BENEFICIARIES

STATUTARNI MESTO BRNO (Brno), 44992785, established in DOMINIKANSKE NAMESTI 196/1, BRNO 602 00, Czech Republic, VAT number CZ44992785, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('13')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

Jaroslav KACER with ECAS id nkacerja signed in the Participant Portal on 16/11/2016 at 12:44:40 (transaction id Sigld-38034odj0vRzzfvLzJM6O2ptPwL8ltMv6l7Tk34ulkUSvWSRqiYv91iQ6ktztMS ZxoAicVvmT1PW2hiMCjIA1N2J2JHW-Jj71zxYb8yrLDSH1hfLDmKjasXOCa1JGr4phqtWt3NJYXngG1ga0YzPCq1rMJ6seY). Timestamp by third party at Wed Nov 16 12:45:27 CET 2016

ACCESSION FORM FOR BENEFICIARIES

COMUNE DI PARMA (Parma), CF00162210348, established in STRADA REPUBBLICA 1, PARMA 43121, Italy, VAT number IT00162210348, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('14')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

Marco GIORGI with ECAS id ngiorgaq signed in the Participant Portal on 05/11/2016 at 13:58:34 (transaction id Sigld-466-PKUxfu6k1laKXS6E3ebzgzV02T4Mr1EuZUQmsinssgB7CfRKzvbepd E4GVN1Ry81zLkLSOGQyAgsy4fkj9hRSVS-Jj71zxYb8yrztJ6ofpqjjT-RwXLq3suVgMB6DabygX8YWy4476YFPE8At8wEnQ5M0e). Timestamp by third party at Sat Nov 05 13:59:06 CET 2016

ACCESSION FORM FOR BENEFICIARIES

URZAD MIEJSKI W GDANSKU (Gdansk), established in UL. NOWE OGRODY 8/12, GDANSK 80 803, Poland, VAT number PL5830011969, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('15')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Piotr GRZELAK with ECAS id ngrzepio signed in the Participant Portal on 29/11/2016 at 12:01:44 (transaction id Sigld-40923-9p0DICjW3ExJFAXPih55E4XRy13KWJ3VM6HBSVa8KjhnLNjsJQZaYjX IIaPNGLzg01IRp1zU1bDK0pkYeJBnI-PHSIUMVSXYCI4G08U3ZwBS-3zSGBR0XzyCauCGfdxl3Ncp8jzNtvzTCozSFu9rgcHIDG). Timestamp by third party at Tue Nov 29 12:02:40 CET 2016

ACCESSION FORM FOR BENEFICIARIES

Ballast Nedam Bouw & Ontwikkeling Holding B.V. (BN) BV, 30166075, established in Ringwade 71, Nieuwegein 3439 LM Nieuwegein, Netherlands, VAT number NL809065745B01, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('16')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

peter KLEVERING with ECAS id nklevepe signed in the Participant Portal on 08/12/2016 at 12:19:43 (transaction id Sigld-10183-ZQTFWQGaPzxExT71IPxc6N9Hea3hhKR2S8TmeYr27INXax3mVEzRwzv UURAHrcVnRIzq6mITqd+T46BctXwNEKK-J712xYb8pvgErwGPo6Oly-HA4gqQBw0uMvbqV3SPwbrmsLC9050zwoLhEZfvd0plx). Timestamp by third party at Thu Dec 08 12:21:07 CET 2016

ACCESSION FORM FOR BENEFICIARIES

ROTTERDAMSE ELEKTRISCHE TRAM NV (RET) NV, 24292838, established in LAAN OP ZUID 2, ROTTERDAM 3071 AA, Netherlands, VAT number NL808067655B01, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('17')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Joop BAKKER with ECAS id nbakjoop signed in the Participant Portal on 02/11/2016 at 12:51:24 (transaction id Sigld-15830-LHcJVHQoZKiPZZpqfIRH2GzWLL45QWOueQazqB5XWB5i6cEjzoUPZv KXQpM2WLYwQanb8E91zcYSqTbFcolAi-Jj71zxYb8yrl8GmV4asVNaiq5NdbkFfGuxk0gOJzyzXH3kVfWxKwbWeuuXTOIhrJzS). Timestamp by third party at Wed Nov 02 12:51:53 CET 2016

ACCESSION FORM FOR BENEFICIARIES

ENECO ZAKELIJK BV (ENE) BV, 24296168, established in MARTEN MEESWEG 5, ROTTERDAM 3068 AV, Netherlands, VAT number NL808464930B01, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('18')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Raymond SPRONKEN with ECAS id nsproray signed in the Participant Portal on 26/10/2016 at 13:22:50 (transaction id Sigld-60055-IFrawuYr92eobyObQ62yQBABZMVqG7KPTJ1JWoGDokCszrt2SCMs6Yq 6E6qQoqPgwQiwL4BVaTAGGtfD8NWZZm-J71zYVb8yrkmoAceBIUCavuzTuv3UAnrH7aobivwy9IKL76mX1xsps0QSLIDKTn8). Timestamp by third party at Wed Oct 26 14:23:18 CEST 2016

ACCESSION FORM FOR BENEFICIARIES

Koninklijke KPN NV (KPN) NV, 02045200, established in MAANPLEIN 55, The Hague 2516 CK, Netherlands, VAT number NL009497006B01, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('19')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Arnoud JULLENS with ECAS id njullear signed in the Participant Portal on 18/11/2016 at 18:26:43 (transaction id Sigld-29389vPvvMwf5JRSt1TD9vSHzLv4JHcJBIHkAWyPf6ZQJAbw2gzIziXSwHeRP2 ZMITzsolwzdHhgJatztSWGVyyHOjPN4-PHSIUMVSXYC3y9Y47r6OLWsWPGnW9RkMxOTjcMxBBzvK7Ykzolof8iFoL4vfzuXMXq). Timestamp by third party at Fri Nov 18 12:27:24 CET 2016

ACCESSION FORM FOR BENEFICIARIES

AKADEMISKA HUS AKTIEBOLAG (AHAB) AB, 5564599156, established in P O BOX 483, GOTEBORG 401 27, Sweden, VAT number SE556459915601, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('20')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Fredrik NYBERG with ECAS id nnybfred signed in the Participant Portal on 10/11/2016 at 09:24:33 (transaction id Sigld-1849-Fy4GHFb39VpJzzzTDzJrQqt3Wds14uMjiZzYBgsepx7EJU9cbCzQWkg ees4s8pBDJ5b1Mov4oALe7ZwutiviCK6G-Jj71zxYb8yrLDSH1hfLDmKeilDziM1prIm1)jrZHcl0d9VQayQ0e4ta83Lp5JQmiK). Timestamp by third party at Thu Nov 10 09:25:14 CET 2016

ACCESSION FORM FOR BENEFICIARIES

VASTERBOTTENS LANS LANDSTING (VCC), 2321000222, established in KOKSVAGEN 11, UMEA 90189, Sweden, VAT number SE232100022201, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('21')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Nils SANDBERG with ECAS id nsandnls signed in the Participant Portal on 08/11/2016 at 19:34:23 (transaction id Sigld-16231-3IIFYOtI5JNKNJNyMVB9Fq7ZH9zwdXezNIRTnKrM8blbFOtzSE7nh0Jfasy0 Y80REgP8LcmgykQW2KZOQUW8{Km-PHsIUMVSXYCEbaUDECOk1C-Y6zapPWcuYwnhyFtLuZLMdrKkIzbGgzbpKnjMXItAGXi). Timestamp by third party at Tue Nov 08 19:34:55 CET 2016

ACCESSION FORM FOR BENEFICIARIES

UMEA ENERGI AKTIEBOLAG (UEAB) AB, 5560978602, established in ., UMEA 901 05, Sweden, VAT number SE556097860201, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('22')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM and the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any amendments to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Goran ERNSTSSON with ECAS id nernstgo signed in the Participant Portal on 04/11/2016 at 08:33:37 (transaction id Sigld-1281-0Q7dwzvPBbBeWvVN3dKqZzi9VMcthdiyIf7b2kZQIfHJo5jr8HPxKzV Rel6zk7xqr7KTXc8fMJUzsHcljba7hj0-PHsIUMVSXYCXfnvHlid7u4-va3ze5zXTJ8RSttlYTBY4zdYH9I7jtNNj2zZGRMr6Y0D). Timestamp by third path at by third party at Fri Nov 04 08:34:15 CET 2016

ACCESSION FORM FOR BENEFICIARIES

UMEA PARKERINGS AKTIEBOLAG (UPAB) AB, 5561310573, established in PO BOX 297, UMEA 901 06, Sweden, VAT number SE556131057301, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('23')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Sanden FRIDA with ECAS id nfridasa signed in the Participant Portal on 26/10/2016 at 12:14:48 (transaction id Sigld-S8720-MBJtxHp6dc6SjcMiVQN2NZbG9fSi9DZLbrZ8984ndQiM7Hm1PvDwCG 1QY5gBwly1DCjv2CrmiNgq5x54uzp5B4-Jj71zxYb8yrkmoAceBIUCadC1pzGSHmT7qRmEhsYXzRtLzyyaK6regR9TkAGnlbhqK). Timestamp by third party at Wed Oct 26 13:15:11 CEST 2016

ACCESSION FORM FOR BENEFICIARIES

SCOTTISH GOVERNMENT (TS), N/A, established in St Andrews House, Regent Road, EDINBURGH EH1 3DG, United Kingdom, VAT number N/A, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('24')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Callum DONNELLY with ECAS id ndonncal signed in the Participant Portal on 02/11/2016 at 15:21:08 (transaction id Sigld-17239-Yal3sMdmMHIvGDfXXor0uRqnKWsFOKplbarfhY9Gfp1PZCfagip7lo uGalszszex5VXzjm6jztJ30qBRpIiVVoC-Jj71zXYb8yrl8GmV4asVNa-NbffcQNnzvjt9XzY3p4wTx1pzzII04cPAxTVMHQy32X0). Timestamp by third party at Wed Nov 02 15:21:42 CET 2016
ACCESSION FORM FOR BENEFICIARIES

SP POWER SYSTEMS LIMITED (SPPS) LTD, SC215841, established in ATLANTIC QUAY 1, GLASGOW G2 8SP, United Kingdom, VAT number GB659372008, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('25')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Watson PEAT with ECAS id npeawats signed in the Participant Portal on 07/11/2016 at 12:09:09 (transaction id Sigld-1604maBsrLvZhIUNTAWr9oXzooVIHiAzfwwzzbT4uEksuzLtVvdzyav6yeaZz U3SPyZ2K2IkmfLcWR75zHmwMIUvg3FQm-Jj71zxYb8yrSvqV41qjZ8qzzzIWH9kzeQN4dzoNyiFVnzcjYNKyp40o8dcyIJ6InJyO). Timestamp by third party at Mon Nov 07 12:09:42 CET 2016

ACCESSION FORM FOR BENEFICIARIES

TENNENT CALEDONIAN BREWERIES UK LIMITED (TCB) LTD, SC362352, established in WELLPARK BREWERY 161 DUKE STREET, GLASGOW G31 1JD, United Kingdom, VAT number GB977375168, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('26')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM and the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any amendments to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Billy MASON with ECAS id nmasbill signed in the Participant Portal on 15/11/2016 at 11:13:29 (transaction id Sigld-18549-2uMizMpL9q0qKOolZmiVtXLbWiNCVSKQYCW035ntLVcvM11ZE75a Drl0xppLfJrLe6l97CjDinm7K1eqwGGzef-Jj71zxYb8yrLDSH1hfLDmK-zZ2eqPESCp8mq7Olkt3gE84mXvK0S3gdW5mVFilSr6P). Timestamp by third party at Tue Nov 15 11:14:11 CET 2016

ACCESSION FORM FOR BENEFICIARIES

SIEMENS PUBLIC LIMITED COMPANY (SIE), 00727817, established in FARADAY HOUSE, SIR WILLIAM SIEMENS SQUARE, FRIMLEY, CAMBERLEY GU16 8QD, United Kingdom, VAT number GB479985260, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('27')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

adrian BROWN with ECAS id nbroaian signed in the Participant Portal on 29/11/2016 at 20:03:07 (transaction id Sigld-51970rJJrzww100uty3oBubwosISwyHoaiu4f9vQSSqgjzbcrApQPNtCes1BhZ 8NwHXsPJZ1mfhoac9BGNs60lelWiJH-PHsIUMVSXYCI4G08U3ZwBSzuaAPvJiNVHcv8kZ3338RsgmTXudBskyIRDzjQk8KUyW). Timestamp by third party at Tue Nov 29 21:04:46 CET 2016

ACCESSION FORM FOR BENEFICIARIES

PICTEC (PIC) PL2, 360457960, established in UL. WIOSENNA 52, GDANSK 80178, Poland, VAT number PL5833173833, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('28')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Mateusz BONECKI with ECAS id nbonmate signed in the Participant Portal on 26/10/2016 at 21:18:23 (transaction id Sigld-66209csFqytjzH0H2IGWU5lojuf4dLukaYQzomoLnlowmZizpK3D3fwBh9xdf 1dAzrKxVNsRfzV4E2Uffj7JTEbnzhdYO-Jj71zxYb8yrkmoAceBIUCai9nr0vIdQFjrPdbzKTTQfeyHFrq0Azhd1uqP5HqdZPcm). Timestamp by third party at Wed Oct 26 22:19:06 CEST 2016

ACCESSION FORM FOR BENEFICIARIES

UNIRESEARCH BV (UNR) BV, 27236872, established in Elektronicaweg 16c, DELFT 2628XG, Netherlands, VAT number NL810590372B01, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('29')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Eric FEENSTRA with ECAS id nfeenser signed in the Participant Portal on 26/10/2016 at 10:51:21 (transaction id Sigld-57026zhfzUyKVRENGZDnj1AlZYtOdUW4wmMZa0dQnTo0h6Mr0aPzxfqi5WV91 PAArpOzywVPT33dk82WYTAVM48JXRL-J71zYtSbyrkmoAceBLUCanza5zri5YMBcM7FCTLiGOTISSH2PheIJ86fhMfldN4mG). Timestamp by third party at Wed Oct 26 11:51:42 CEST 2016

ACCESSION FORM FOR BENEFICIARIES

INFOMOBILITY SPA (INF) SPA, 218650, established in VIALE MENTANA 27, PARMA 43100, Italy, VAT number IT02199590346, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('30')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Giovanni BACOTELLI with ECAS id nbacotgi signed in the Participant Portal on 26/10/2016 at 12:09:23 (transaction id Sigld-58639-4La4hN9GhblB8lGqkycwmh4LM2L8Kdzs7D9EiUzWWze5Y07IzTuy0KV JNHOSWWRMzraR6598NpzSrPzZ33rk2t6a-J71zxYb8yrkmoAceBIUCa-UYeSx6QPYM0FRtPUzQKrC5JrlpbuEP8NlvqKNALeYHm). Timestamp by third party at Wed Oct 613:09:45 CEST 2016

ACCESSION FORM FOR BENEFICIARIES

FUTURE INSIGHT GROUP BV (FI) BV, 63664836, established in HANZEPLEIN 11-27, ZWOLLE 8017 JD, Netherlands, VAT number NL855342468B01, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('31')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Rick KLOOSTER with ECAS id nklorick signed in the Participant Portal on 26/10/2016 at 15:46:46 (transaction id Sigld-63677-VUyQgf4VXLbzkXwSJaoHyBLChcpzHvuVW5TX4GzVJFtV7hoN1zwXbRx smWBm2zr1oSLJUnxnCAEtIDNudhXmQyL-JJ71zxYb8yrkmoAceBIUCazGLKYpjaFw4U6rfzvqNY4LxNfwD1nrPQD1p7kGrorFIG). Timestamp by third party at Wed Oct 26 16:47:14 CEST 2016

ACCESSION FORM FOR BENEFICIARIES

THE GLASGOW HOUSING ASSOCIATION LIMITED IPS (WG) GB25, SP2572RS, established in TRONGATE 177 GRANITE HOUSE, GLASGOW G1 5HF, United Kingdom, VAT number GB796709466, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('32')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM and the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any amendments to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Colin REID with ECAS id nreidcli signed in the Participant Portal on

Vulpack and the second second

third party at Mon Nov 14 13:07:53 CET 2016

ACCESSION FORM FOR BENEFICIARIES

GDANSKA INFRASTRUCTURA WODOCIAGOWO-KANALIZACYJNA SP ZOO (GIWK) SP(ZOO), 193079339, established in UL. KARTUSKA 201, GDANSK 80 122, Poland, VAT number PL5832870369, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('33')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM and the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any amendments to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Jacek SKARBEK with ECAS id nskarjac signed in the Participant Portal on 27/10/2016 at 11:09:12 (transaction id Sigld-72109-qiycagXRK5a9QLFR5rtwICVQegjHawyAaCizc5zbNzy1E4ts2btICYZRe mmNBY5ipvgWSrfeH52hBdYEqrMnCyW-J]71zxYb8yrkmoAceBIUCa-TBmukgfMmroR8YCRitvB4wKBktQLjvtDXqKVo3wChDm). Timestamp by third party at Thu Oct 27 12:09:43 CEST 2016

ACCESSION FORM FOR BENEFICIARIES

ACREO SWEDISH ICT AB (SI) AB, 5565349007, established in BOX 1070, KISTA 164 25, Sweden, VAT number SE556534900701, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('34')

in Grant Agreement No 731198 ('the Agreement')

between GEMEENTE ROTTERDAM **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),

for the action entitled 'Rotterdam, Umea and Glasgow: Generating Exemplar Districts In Sustainable Energy Deployment (Ruggedised)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

Peter BJÖRKHOLM with ECAS id nbjopete signed in the Participant Portal on 25/11/2016 at 16:44:52 (transaction id Sigld-13841okarB0eNOKJxdaENtMxNY91TnfrLQgGAkVc4K47XCdJa5fZrLWDyAropto xQ2LuLcXDWrOr0XSsgzs5wKYvLEmu-PHeIJUWSXYCI4G08U3ZwBSznwVZJnEM3YzItAeLCX3pYJHYXfe4OqzN6pZXbDJythC). Timestamp by third party at Fri Nov 25 16:45:45 CET 2016

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MODEL ANNEX 4 FOR H2020 GENERAL MGA - MULTI

FINANCIAL STATEMENT FOR [BENEFICIARY [name]/ LINKED THIRD PARTY [name]] FOR REPORTING PERIOD [reporting period]

						Eligible ¹ co	sts (per budget	category)						Receipts		EU contributior	_	Additional information
	A. I	Direct personn	el costs	B. Dir subco	ect costs [C of of of	. Direct costs fin. support]	D. Other dire	ect costs	E. Indirect costs ²	V	c. Costs of	J I	Total costs	Receipts	Reimbursem ent rate %	Maximum EU contribution ³	Requested EU contribution	Information for indirect costs :
	A.1 Employees (or t	equivalent)	A.4 SME owners without salary			Δ	0.1 Travel //	D.4 Costs of Irge research		[F.1 Costs	Jf]			Receipts of the action, to be				Costs of in-kind contributions
	A.2 Natural persons contract	s under direct	A.5 Beneficiaries t are natural person without salarv	hat Is			in .2 Equipment	nfrastructure]						reported in the last reporting period, according to Article				not used on premises
	A.3 Seconded perso	suc					.3 Other goods							5.5.0				
	[A.6 Personnel for μ to research infrastri	providing access ucture]				0	nd services											
Form of costs	Actual	Unit	Unit	4	Actual	Actual	Actual	Actual	Flat-rate ⁵	Unit		Unit						
									25%									
	ŋ	Total b	No hours Tot	al c	q	[<i>e</i>]	÷	[6]	h=0,25 x (a+b+ c+f+[g] + [11] ⁶ + [12] ⁶ - o)	No units	[منعا [انا]	Total [<i>i2</i>] a	j = :b+c+d+[e] +f +[j] +h+[i1] +[i2]	*		Ε	c	O
[short name beneficiary/linked third party]																		

The beneficiary/linked third party hereby confirms that:

The information provided is complete, reliable and true. The costs declared are eligible (see Article 6). The costs can be substantiated by adequate records and supporting documentation that will be produced upon request or in the context of checks, reviews, audits and investigations (see Articles 17, 18 and 22). For the last reporting period: that all the receipts have been declared (see Article 5.3.3).

D Please declare all eligible costs, even if they exceed the amounts indicated in the estimated budget (see Annex 2). Only amounts that were declared in your individual financial statements can be taken into account lateron, in order to replace other costs that are found to be ineligible.

¹ See Article 6 for the eligibility conditions

² The indirect costs claimed must be free of any amounts covered by an operating grant (received under any EU or Euratom funding programme; see Article 6.2.E). If you have received an operating grant during this reporting period, you cannot claim any indirect costs.

³ This is the *theoretical* amount of EU contribution that the system calculates automatically (by multiplying the reimbursement rate by the total costs declared). The amount you request (in the column 'requested EU contribution') may have to be less (e.g. if you and the other beneficiaries are above budget, if the 90% limit (see Article 21) is reached, etc).

⁴ See Article 5 for the form of costs

⁵ Flat rate : 25% of eligible direct costs, from which are excluded: direct costs of subcontracting, costs of in-kind contributions not used on premises, direct costs of financial support, and unit costs declared under budget category F if they include indirect costs (see Article 6.2.E) ⁶ Only specific unit costs that do not include indirect costs

ANNEX 5

MODEL FOR THE CERTIFICATE ON THE FINANCIAL STATEMENTS

- For options [*in italics in square brackets*]: choose the applicable option. Options not chosen should be deleted.
- > For fields in [grey in square brackets]: enter the appropriate data

TABLE OF CONTENTS

Terms of Reference for an Independent Report of Factual Findings on costs declared under a Grant Agreement financed under the Horizon 2020 Research and Innovation Framework Programme

This document sets out the 'Terms of Reference (ToR)' under which

[OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')]

agrees to engage

[insert legal name of the auditor] ('the Auditor')

to produce an independent report of factual findings ('the Report') concerning the Financial Statement(s)¹ drawn up by the [Beneficiary] [Linked Third Party] for the Horizon 2020 grant agreement [insert number of the grant agreement, title of the action, acronym and duration from/to] ('the Agreement'), and

to issue a Certificate on the Financial Statements' ('CFS') referred to in Article 20.4 of the Agreement based on the compulsory reporting template stipulated by the Commission.

The Agreement has been concluded under the Horizon 2020 Research and Innovation Framework Programme (H2020) between the Beneficiary and [OPTION 1: the European Union, represented by the European Commission ('the Commission')][OPTION 2: the European Atomic Energy Community (Euratom,) represented by the European Commission ('the Commission')][OPTION 3: the [Research Executive Agency (REA)] [European Research Council Executive Agency (ERCEA)] [Innovation and Networks Executive Agency (INEA)] [Executive Agency for Small and Medium-sized Enterprises (EASME)] ('the Agency'), under the powers delegated by the European Commission ('the Commission').]

¹ By which costs under the Agreement are declared (see template 'Model Financial Statements' in Annex 4 to the Grant Agreement).

The *[Commission]* [*Agency*] is mentioned as a signatory of the Agreement with the Beneficiary only. The *[European Union]*[*Euratom]*[*Agency*] is not a party to this engagement.

1.1 Subject of the engagement

The coordinator must submit to the *[Commission][Agency]* the final report within 60 days following the end of the last reporting period which should include, amongst other documents, a CFS for each beneficiary and for each linked third party that requests a total contribution of EUR 325 000 or more, as reimbursement of_actual costs and unit costs calculated on the basis of its usual cost accounting practices (see Article 20.4 of the Agreement). The CFS must cover all reporting periods of the beneficiary or linked third party indicated above.

The Beneficiary must submit to the coordinator the CFS for itself and for its linked third party(ies), if the CFS must be included in the final report according to Article 20.4 of the Agreement..

The CFS is composed of two separate documents:

- The Terms of Reference ('the ToR') to be signed by the [Beneficiary] [Linked Third Party] and the Auditor;
- The Auditor's Independent Report of Factual Findings ('the Report') to be issued on the Auditor's letterhead, dated, stamped and signed by the Auditor (or the competent public officer) which includes the agreed-upon procedures ('the Procedures') to be performed by the Auditor, and the standard factual findings ('the Findings') to be confirmed by the Auditor.

If the CFS must be included in the final report according to Article 20.4 of the Agreement, the request for payment of the balance relating to the Agreement cannot be made without the CFS. However, the payment for reimbursement of costs covered by the CFS does not preclude the *[Commission,][Agency,]* the European Anti-Fraud Office and the European Court of Auditors from carrying out checks, reviews, audits and investigations in accordance with Article 22 of the Agreement.

1.2 Responsibilities

The [Beneficiary] [Linked Third Party]:

- must draw up the Financial Statement(s) for the action financed by the Agreement in compliance with the obligations under the Agreement. The Financial Statement(s) must be drawn up according to the [Beneficiary's] [Linked Third Party's] accounting and book-keeping system and the underlying accounts and records;
- must send the Financial Statement(s) to the Auditor;
- is responsible and liable for the accuracy of the Financial Statement(s);
- is responsible for the completeness and accuracy of the information provided to enable the Auditor to carry out the Procedures. It must provide the Auditor with a written representation letter supporting these statements. The written representation letter must state the period covered by the statements and must be dated;
- accepts that the Auditor cannot carry out the Procedures unless it is given full access to the [Beneficiary's] [Linked Third Party's] staff and accounting as well as any other relevant records and documentation.

The Auditor:

- [Option 1 by default: is qualified to carry out statutory audits of accounting documents in accordance with Directive 2006/43/EC of the European Parliament and of the Council of 17 May 2006 on statutory audits of annual accounts and consolidated accounts, amending Council Directives 78/660/EEC and 83/349/EEC and repealing Council Directive 84/253/EEC or similar national regulations].
- [Option 2 if the Beneficiary or Linked Third Party has an independent Public Officer: is a competent and independent Public Officer for which the relevant national authorities have established the legal capacity to audit the Beneficiary].
- [Option 3 if the Beneficiary or Linked Third Party is an international organisation: is an [internal] [external] auditor in accordance with the internal financial regulations and procedures of the international organisation].

The Auditor:

- must be independent from the Beneficiary [and the Linked Third Party], in particular, it must not have been involved in preparing the [Beneficiary's] [Linked Third Party's] Financial Statement(s);
- must plan work so that the Procedures may be carried out and the Findings may be assessed;
- must adhere to the Procedures laid down and the compulsory report format;
- must carry out the engagement in accordance with this ToR;
- must document matters which are important to support the Report;
- must base its Report on the evidence gathered;
- must submit the Report to the [Beneficiary] [Linked Third Party].

The Commission sets out the Procedures to be carried out by the Auditor. The Auditor is not responsible for their suitability or pertinence. As this engagement is not an assurance engagement, the Auditor does not provide an audit opinion or a statement of assurance.

1.3 Applicable Standards

The Auditor must comply with these Terms of Reference and with²:

- the International Standard on Related Services ('ISRS') 4400 Engagements to perform Agreed-upon Procedures regarding Financial Information as issued by the International Auditing and Assurance Standards Board (IAASB);
- the *Code of Ethics for Professional Accountants* issued by the International Ethics Standards Board for Accountants (IESBA). Although ISRS 4400 states that independence is not a requirement for engagements to carry out agreed-upon procedures, the *[Commission][Agency]* requires that the Auditor also complies with the Code's independence requirements.

The Auditor's Report must state that there is no conflict of interests in establishing this Report between the Auditor and the Beneficiary [and the Linked Third Party], and must specify - if the service is invoiced - the total fee paid to the Auditor for providing the Report.

1.4 Reporting

The Report must be written in the language of the Agreement (see Article 20.7).

Under Article 22 of the Agreement, the [*Commission*] [*Agency*], the European Anti-Fraud Office and the Court of Auditors have the right to audit any work that is carried out under the action and for which costs are declared from [*the European Union*] [*Euratom*] budget. This includes work related to this engagement. The Auditor must provide access to all working papers (e.g. recalculation of hourly rates, verification of the time declared for the action) related to this assignment if the [*Commission*] [*Agency*], the European Anti-Fraud Office or the European Court of Auditors requests them.

1.5 Timing

The Report must be provided by [dd Month yyyy].

² Supreme Audit Institutions applying INTOSAI-standards may carry out the Procedures according to the corresponding International Standards of Supreme Audit Institutions and code of ethics issued by INTOSAI instead of the International Standard on Related Services ('ISRS') 4400 and the Code of Ethics for Professional Accountants issued by the IAASB and the IESBA.

1.6 Other terms

[The [Beneficiary] [Linked Third Party] and the Auditor can use this section to agree other specific terms, such as the Auditor's fees, liability, applicable law, etc. Those specific terms must not contradict the terms specified above.]

[legal name of the Auditor]	[legal name of the [Beneficiary][Linked Third Party]]
[name & function of authorised representative	[name & function of authorised representative]
[dd Month yyyy]	[dd Month yyyy]
Signature of the Auditor	Signature of the [Beneficiary][Linked Third Party]

Independent Report of Factual Findings on costs declared under Horizon 2020 Research and Innovation Framework Programme

(To be printed on the Auditor's letterhead)

То

[name of contact person(s)], [Position]

[[Beneficiary's] [Linked Third Party's] name]

[Address]

[dd Month yyyy]

Dear [Name of contact person(s)],

As agreed under the terms of reference dated [dd Month yyyy]

with [OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')],

we

[name of the auditor] ('the Auditor'),

established at

[full address/city/state/province/country],

represented by

[name and function of an authorised representative],

have carried out the procedures agreed with you regarding the costs declared in the Financial Statement(s)³ of the [Beneficiary] [Linked Third Party] concerning the grant agreement

[insert grant agreement reference: number, title of the action and acronym] ('the Agreement'),

with a total cost declared of

[total amount] EUR,

and a total of actual costs and 'direct personnel costs declared as unit costs calculated in accordance with the [*Beneficiary's*] [*Linked Third Party's*] usual cost accounting practices' declared of

[sum of total actual costs and total direct personnel costs declared as unit costs calculated in accordance with the [Beneficiary's] [Linked Third Party's] usual cost accounting practices] EUR

and hereby provide our Independent Report of Factual Findings ('the Report') using the compulsory report format agreed with you.

The Report

Our engagement was carried out in accordance with the terms of reference ('the ToR') appended to this Report. The Report includes the agreed-upon procedures ('the Procedures') carried out and the standard factual findings ('the Findings') examined.

The Procedures were carried out solely to assist the [*Commission*] [*Agency*] in evaluating whether the [*Beneficiary's*] [*Linked Third Party's*] costs in the accompanying Financial Statement(s) were declared in accordance with the Agreement. The [*Commission*] [*Agency*] draws its own conclusions from the Report and any additional information it may require.

³ By which the Beneficiary declares costs under the Agreement (see template 'Model Financial Statement' in Annex 4 to the Agreement).

The scope of the Procedures was defined by the Commission. Therefore, the Auditor is not responsible for their suitability or pertinence. Since the Procedures carried out constitute neither an audit nor a review made in accordance with International Standards on Auditing or International Standards on Review Engagements, the Auditor does not give a statement of assurance on the Financial Statements.

Had the Auditor carried out additional procedures or an audit of the [Beneficiary's] [Linked Third Party's] Financial Statements in accordance with International Standards on Auditing or International Standards on Review Engagements, other matters might have come to its attention and would have been included in the Report.

Not applicable Findings

We examined the Financial Statement(s) stated above and considered the following Findings not applicable:

Explanation (to be removed from the Report):

If a Finding was not applicable, it must be marked as '**N.A**.' ('Not applicable') in the corresponding row on the right-hand column of the table and means that the Finding did not have to be corroborated by the Auditor and the related Procedure(s) did not have to be carried out.

The reasons of the non-application of a certain Finding must be obvious i.e.

- *i) if no cost was declared under a certain category then the related Finding(s) and Procedure(s) are not applicable;*
- ii) if the condition set to apply certain Procedure(s) are not met the related Finding(s) and those Procedure(s) are not applicable. For instance, for 'beneficiaries with accounts established in a currency other than euro' the Procedure and Finding related to 'beneficiaries with accounts established in euro' are not applicable. Similarly, if no additional remuneration is paid, the related Finding(s) and Procedure(s) for additional remuneration are not applicable.

List here all Findings considered not applicable for the present engagement and explain the reasons of the non-applicability.

••••

Exceptions

Apart from the exceptions listed below, the [Beneficiary] [Linked Third Party] provided the Auditor all the documentation and accounting information needed by the Auditor to carry out the requested Procedures and evaluate the Findings.

Explanation (to be removed from the Report):

- If the Auditor was not able to successfully complete a procedure requested, it must be marked as 'E' ('Exception') in the corresponding row on the right-hand column of the table. The reason such as the inability to reconcile key information or the unavailability of data that prevents the Auditor from carrying out the Procedure must be indicated below.
- If the Auditor cannot corroborate a standard finding after having carried out the corresponding
 procedure, it must also be marked as 'E' ('Exception') and, where possible, the reasons why the Finding
 was not fulfilled and its possible impact must be explained here below.

List here any exceptions and add any information on the cause and possible consequences of each exception, if known. If the exception is quantifiable, include the corresponding amount.

••••

Example (to be removed from the Report):

- 1. The Beneficiary was unable to substantiate the Finding number 1 on ... because
- 2. Finding number 30 was not fulfilled because the methodology used by the Beneficiary to calculate unit costs was different from the one approved by the Commission. The differences were as follows: ...
- 3. After carrying out the agreed procedures to confirm the Finding number 31, the Auditor found a difference of ______ EUR. The difference can be explained by ...

Further Remarks

In addition to reporting on the results of the specific procedures carried out, the Auditor would like to make the following general remarks:

Example (to be removed from the Report):

- 1. Regarding Finding number 8 the conditions for additional remuneration were considered as fulfilled because ...
- 2. In order to be able to confirm the Finding number 15 we carried out the following additional procedures:

Use of this Report

This Report may be used only for the purpose described in the above objective. It was prepared solely for the confidential use of the [Beneficiary] [Linked Third Party] and the [Commission] [Agency], and only to be submitted to the [Commission] [Agency] in connection with the requirements set out in Article 20.4 of the Agreement. The Report may not be used by the [Beneficiary] [Linked Third Party] or by the [Commission] [Agency] for any other purpose, nor may it

be distributed to any other parties. The [*Commission*] [*Agency*] may only disclose the Report to authorised parties, in particular to the European Anti-Fraud Office (OLAF) and the European Court of Auditors.

This Report relates only to the Financial Statement(s) submitted to the [*Commission*] [*Agency*] by the [*Beneficiary*] [*Linked Third Party*] for the Agreement. Therefore, it does not extend to any other of the [*Beneficiary's*] [*Linked Third Party's*] Financial Statement(s).

There was no conflict of interest⁴ between the Auditor and the Beneficiary [and Linked Third Party] in establishing this Report. The total fee paid to the Auditor for providing the Report was EUR ______ (including EUR______ of deductible VAT).

We look forward to discussing our Report with you and would be pleased to provide any further information or assistance.

[legal name of the Auditor]

[name and function of an authorised representative]

[dd Month yyyy]

Signature of the Auditor

A conflict of interest arises when the Auditor's objectivity to establish the certificate is compromised in fact or in appearance when the Auditor for instance:

⁻ was involved in the preparation of the Financial Statements;

⁻ stands to benefit directly should the certificate be accepted;

⁻ has a close relationship with any person representing the beneficiary;

⁻ is a director, trustee or partner of the beneficiary; or

⁻ is in any other situation that compromises his or her independence or ability to establish the certificate impartially.

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H2020 Model Grant Agreements: General MGA - Multi: June 2014

Agreed-upon procedures to be performed and standard factual findings to be confirmed by the Auditor

The European Commission reserves the right to i) provide the auditor with additional guidance regarding the procedures to be followed or the facts to be ascertained and the way in which to present them (this may include sample coverage and findings) or to ii) change the procedures, by notifying the Beneficiary in writing. The procedures carried out by the auditor to confirm the standard factual finding are listed in the table below

If this certificate relates to a Linked Third Party, any reference here below to 'the Beneficiary' is to be considered as a reference to 'the Linked Third Party'.

The 'result' column has three different options: 'C', 'E' and 'N.A.':

- 'C' stands for 'confirmed' and means that the auditor can confirm the 'standard factual finding' and, therefore, there is no exception to be reported. A
- 'E' stands for 'exception' and means that the Auditor carried out the procedures but cannot confirm the 'standard factual finding', or that the Auditor was not able to carry out a specific procedure (e.g. because it was impossible to reconcile key information or data were unavailable), А
- 'N.A.' stands for 'not applicable' and means that the Finding did not have to be examined by the Auditor and the related Procedure(s) did not have then the related Finding(s) and Procedure(s) are not applicable; ii) if the condition set to apply certain Procedure(s) are not met then the related Finding(s) and Procedure(s) are not applicable. For instance, for 'beneficiaries with accounts established in a currency other than the euro' the to be carried out. The reasons of the non-application of a certain Finding must be obvious i.e. i) if no cost was declared under a certain category Procedure related to 'beneficiaries with accounts established in euro' is not applicable. Similarly, if no additional remuneration is paid, the related Finding(s) and Procedure(s) for additional remuneration are not applicable. А

J.C		والمسامينا ومطمعها وسمايسم	Result
	Loceanies		(C / E / N.A.)
٨	ACTUAL PERSONNEL COSTS AND UNIT COSTS CALCULATED BY THE BENEFICIARY IN ACCORDANCE	VITH ITS USUAL COST ACCOUNTIN	G PRACTICE

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	The Auditor draws a sample of persons whose costs were declared in the Financial Statement(s) to carry out the procedures indicated in the consecutive points of this section A. (<i>The sample should be selected randomly so that it is representative. Full coverage is required if there are fewer than 10 people (including employees, natural persons working under a direct contract and personnel seconded by a third party), otherwise the sample should have a minimum of 10 people, or 10% of the total, whichever number is the highest) The Auditor sampled and the total of the total</i>		
A.1	 PERSONNEL COSTS For the persons included in the sample and working under an employment contract or equivalent act (general procedures for individual actual personnel costs and personnel costs declared as unit costs) To confirm standard factual findings 1-5 listed in the next column, the Auditor reviewed following information/documents provided by the Beneficiary: a list of the persons included in the sample indicating the period(s) during which they worked for the action, their position (classification or category) and type of contract; the payslips of the employees included in the sample; reconciliation of the personnel costs declared in the Financial Statement(s) with the accounting system (project accounting and general ledger) and payroll system; information concerning the employment status and employment conditions of personnel included in the sample, in particular their employment contracts or equivalent; 	 The employees were i) directly hired by the Beneficiary in accordance with its national legislation, ii) under the Beneficiary's sole technical supervision and responsibility and iii) remunerated in accordance with the Beneficiary's usual practices. Personnel costs were recorded in the Beneficiary's accounts/payroll system. Costs were adequately supported and reconciled with the accounts and payroll 	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	 the Beneficiary's usual policy regarding payroll matters (e.g. salary policy, overtime policy, variable pay); applicable national law on taxes, labour and social security and any other document that supports the personnel costs declared. The Auditor also verified the eligibility of all components of the retribution (see Article 6 GA)	records. 4) Personnel costs did not contain any ineligible elements.	
	and recalculated the personnel costs for employees included in the sample.	5) There were no discrepancies between the personnel costs charged to the action and the costs recalculated by the Auditor.	
	Further procedures if 'additional remuneration' is paid To confirm standard factual findings 6-9 listed in the next column, the Auditor: • reviewed relevant documents provided by the Beneficiary (legal form, legal/statutory	 The Beneficiary paying "additional remuneration" was a non-profit legal entity. 	
	obligations, the Beneficiary's usual policy on additional remuneration, criteria used for its calculation);	7) The amount of additional remuneration paid	
	 recalculated the amount of additional remuneration eligible for the action based on the supporting documents received (full-time or part-time work, exclusive or non-exclusive dedication to the action, etc.) to arrive at the applicable FTE/year and pro-rata rate (see data collected in the course of carrying out the procedures under A.2 'Productive hours' and A.4 'Time recording system'). 	corresponded to the Beneficiary's usual remuneration practices and was consistently paid whenever the same kind of work or expertise was required.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	IF ANY PART OF THE REMUNERATION PAID TO THE EMPLOYEE IS NOT MANDATORY ACCORDING TO THE NATIONAL LAW OR THE EMPLOYMENT CONTRACT ("ADDITIONAL REMUNERATION") AND IS ELIGIBLE UNDER THE PROVISIONS OF ARTICLE 6.2.A.1, THIS CAN BE CHARGED AS ELIGIBLE COST TO THE ACTION UP TO THE FOLLOWING AMOUNT:	8) The criteria used to calculate the additional remuneration were objective and generally applied by the Beneficiary regardless of the source of funding used.	
	 (A) IF THE PERSON WORKS FULL TIME AND EXCLUSIVELY ON THE ACTION DURING THE FULL YEAR: UP TO EUR - 8 000/YEAR; 	9) The amount of additional	
	(B) IF THE PERSON WORKS EXCLUSIVELY ON THE ACTION BUT NOT FULL-TIME OR NOT FOR THE FULL YEAR: UP TO THE CORRESPONDING PRO-RATA AMOUNT OF EUR 8 000, OR	personnel costs charged to the action was capped at EUR 8,000	
	(c) IF THE PERSON DOES NOT WORK EXCLUSIVELY ON THE ACTION: UP TO A PRO-RATA AMOUNT CALCULATED IN ACCORDANCE TO ARTICLE 6.2.A.1 .	per FTE/year (up to the equivalent pro-rata amount if the person did not work on the action full-time during the year	
		or ald not work exclusively on the action).	
	Additional procedures in case "unit costs calculated by the Beneficiary in accordance with its usual cost accounting practices" is applied: Apart from carrying out the procedures indicated above to confirm standard factual findings 1-5 and, if applicable, also 6-9, the Auditor carried out following procedures to confirm standard	10) The personnel costs included in the Financial Statement were calculated in accordance with the Beneficiary's usual cost accounting practice. This methodology was consistently	
	factual findings 10-13 listed in the next column:	used in all H2020 actions.	

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	Total personne calculating the consistent with recorded in accounts. Any estimated element use	tal personne lculating the insistent with corded in counts. <u>y estimated</u> we enent use eneficiary in llculation we llculating pers irresponded t	ersonne ent with eat with its. tts. tta tta iary in iary in iary in cing pers onded t itural pe ttural pe ttural pe ttural pe
	13)	13) Ar el« Bf Ca Ca Ca Ca Ca Ca	13)Anyes13)AnyeselemenBeneficBeneficcalculatcalculatcalculatcorrespverifiab14)Thetotheunderinstruct
the Beneficiary's usual cost accounting practice was applied for ts subject of the present CFS; yees included in the sample were charged under the correct categ ith the criteria used by the Beneficiary to establish person ewing the contract/HR-record or analytical accounting records:	ere is no difference between the total amount of personnel costs used cost per unit and the total amount of personnel costs recorded in	ere is no difference between the total amount of personnel costs used cost per unit and the total amount of personnel costs recorded in ints; er actual personnel costs were adjusted on the basis of budgeted nents and, if so, verified whether those elements used are actu s calculation, objective and supported by documents.	ere is no difference between the total amount of personnel costs usec cost per unit and the total amount of personnel costs recorded in ints; er actual personnel costs were adjusted on the basis of budgeted nents and, if so, verified whether those elements used are actu: calculation, objective and supported by documents. <u>Iuded in the sample and working with the Beneficiary under a direct employment contract, such as consultants (no subcontractors)</u> . ctual findings 14-18 listed in the next column the Auditor reviewed
the its su yees ith	/ reviewin there is no e cost pe	intes) by reviewin d that there is no ating the cost pe ory accounts; d whether actua ated elements a int for the calcula	categories) by reviewin verified that there is no calculating the cost pe statutory accounts; verified whether actua estimated elements a relevant for the calcula <u>ural persons included in</u> <u>t other than an employr</u> irm standard factual fino

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			Result
Ref	Procedures	Standard factual finding	(C / E / N.A.)
	 the employment conditions of staff in the same category to compare costs and; any other document that supports the costs declared and its registration (e.g. invoices, 	16) The results of work carried out belong to the Beneficiary.	
	accounting records, etc.).	17) Their costs were not significantly different from those for staff who performed similar tasks under an	
		employment contract with the Beneficiary.	
		18) The costs were supported by audit evidence and registered in the accounts.	
	For personnel seconded by a third party and included in the sample (not subcontractors)	19) Seconded personnel reported	
	To confirm standard factual findings 19-22 listed in the next column, the Auditor reviewed	to the Beneficiary and worked on the Beneficiary's premises	
	following information/documents provided by the Beneficiary:	(unless otherwise agreed with	
	$\circ~$ their secondment contract(s) notably regarding costs, duration, work description, place	the Beneficiary).	
	of work and ownership of the results;	20) The results of work carried out	
	$\circ~$ if there is reimbursement by the Beneficiary to the third party for the resource made	belong to the Beneficiary.	
	available_(in-kind contribution against payment): any documentation that supports the	If personnel is seconded against	
	costs declared (e.g. contract, involce, bank payment, and proot of registration in its accounting/payroll, etc.) and reconciliation of the Financial Statement(s) with the	payment:	
	accounting system (project accounting and general ledger) as well as any proof that the	21) The costs declared were	
	amount invoiced by the third party did not include any profit;	supported with documentation	
		and recorded in the	

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Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	 o if there is no reimbursement by the Beneficiary to the third party for the resource made available (in-kind contribution free of charge): a proof of the actual cost borne by the Third Party for the resource made available free of charge to the Beneficiary such as a statement of costs incurred by the Third Party and proof of the registration in the Third Party's accounting/payroll; o any other document that supports the costs declared (e.g. invoices, etc.). 	Beneficiary's accounts. The third party did not include any profit. <i>f personnel is seconded free of</i> <i>charge:</i> 22) The costs declared did not exceed the third party's cost as recorded in the accounts of the third party and were supported with documentation.	
A.2	 PRODUCTIVE HOURS To confirm standard factual findings 23-28 listed in the next column, the Auditor reviewed relevant documents, especially national legislation, labour agreements and contracts and time records of the persons included in the sample, to verify that: the annual productive hours applied were calculated in accordance with one of the methods described below, the full-time equivalent (FTEs) ratios for employees not working full-time were correctly calculated. 	 23) The Beneficiary applied method [<i>choose one option and delete the others</i>] [A: 1720 hours] [B: the 'total number of hours worked'] [B: the 'total number of nurs used correspond to usual accounting practices] 	

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Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	If the Beneficiary applied method B, the auditor verified that the correctness in which the total number of hours worked was calculated and that the contracts specified the annual workable	24) Productive hours were calculated annually.	
	hours. If the Beneficiary applied method C, the auditor verified that the 'annual productive hours' applied when calculating the hourly rate were equivalent to at least 90 % of the 'standard	25) For employees not working full-time the full-time equivalent (FTE) ratio was correctly applied.	
	annual workable hours'. The Auditor can only do this if the calculation of the standard annual workable hours can be supported by records, such as national legislation, labour agreements, and contracts.	<i>If the Beneficiary applied method B.</i> 26) The calculation of the number of 'annual workable hours',	
	BENEFICIARY'S PRODUCTIVE HOURS' FOR PERSONS WORKING FULL TIME SHALL BE ONE OF THE FOLLOWING METHODS: A. 1720 ANNUAL PRODUCTIVE HOURS (PRO-RATA FOR PERSONS NOT WORKING FULL-TIME)	overtime and absences was verifiable based on the documents provided by the Beneficiary.	
	B. THE TOTAL NUMBER OF HOURS WORKED BY THE PERSON FOR THE BENEFICIARY IN THE YEAR (THIS METHOD IS ALSO REFERED TO AS 'TOTAL NUMBER OF HOURS WORKED' IN THE NEXT COLUMN). THE CALCULATION OF THE TOTAL NUMBER OF HOURS WORKED WAS DONE AS FOLLOWS: ANNUAL WORKABLE HOURS OF THE PERSON ACCORDING TO THE EMPLOYMENT CONTRACT, APPLICABLE LABOUR AGREEMENT OR NATIONAL LAW PLUS OVERTIME WORKED MINUS ABSENCES (SUCH AS SICK LEAVE OR SPECIAL LEAVE).	<i>If the Beneficiary applied method C.</i> 27) The calculation of the number of 'standard annual workable hours' was verifiable based on the documents provided by the Beneficiary.	

			Result
Ket	Procedures	Standard factual finding	(C / E / N.A.)
	C. THE STANDARD NUMBER OF ANNUAL HOURS GENERALLY APPLIED BY THE BENEFICIARY FOR ITS PERSONNEL IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICES (THIS METHOD IS ALSO REFERRED TO AS 'TOTAL		
	ANNUAL PRODUCTIVE HOURS' IN THE NEXT COLUMN). THIS NUMBER MUST BE AT LEAST 90% OF THE	(3) The annual productive nours used for calculating the hourly	
	STANDARD ANNUAL WORKABLE HOURS.	rate were consistent with the usual cost accounting practices	
	עזאוווא אינעטאיני ב הטווסכ, איניאונ בהנ טנוטט טרוטאר אווער ברוב טנטכטאואני איזונב ער אינעעער איז דהר, איז דריע,	of the Beneficiary and were	
		the 'annual workahle hours'	
	EMPLOYER'S DISPOSAL AND CARRYING OUT HIS/HER ACTIVITY OR DUTIES UNDER THE EMPLOYMENT CONTRACT,		
	APPLICABLE COLLECTIVE LABOUR AGREEMENT OR NATIONAL WORKING TIME LEGISLATION.		
A.3	HOURLY PERSONNEL RATES	(9) The Beneficiary applied	
	I) For unit costs calculated in accordance to the Beneficiary's usual cost accounting practice (unit	[choose one option and delete the other]:	
	<u>costs):</u>	[Option I: "Unit costs (hourly	
	If the Beneficiary has a "Certificate on Methodology to calculate unit costs " (CoMUC) approved	rates) were calculated in	
	by the Commission, the Beneficiary provides the Auditor with a description of the approved	accordance with the	
	methodology and the Commission's letter of acceptance. The Auditor verified that the	Beneficiary's usual cost	
	Beneficiary has indeed used the methodology approved. If so, no further verification is	accounting practices"]	
	necessary.	[Option II: Individual hourly	
	If the Beneficiary does not have a "Certificate on Methodology" (CoMUC) approved by the	rates were applied]	

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	Commission, or if the methodology approved was not applied, then the Auditor:	or option I concerning unit costs	
	 reviewed the documentation provided by the Beneficiary, including manuals and 	ind if the Beneficiary applies the	
	internal guidelines that explain how to calculate hourly rates;	nethodology approved by the	
	\circ recalculated the unit costs (hourly rates) of staff included in the sample following the	Commission (CoMUC):	
	results of the procedures carried out in A.1 and A.2.	(0) The Beneficiary used the	
		Commission-approved metho-	
	<u>II) For individual hourly rates:</u>	dology to calculate hourly	
		rates. It corresponded to the	
		organisation's usual cost	
	\circ reviewed the documentation provided by the Beneficiary, including manuals and	accounting practices and was	
	internal guidelines that explain how to calculate hourly rates;	applied consistently for all	
	\circ recalculated the hourly rates of staff included in the samule following the results of the	activities irrespective of the	
	procedures carried out in A.1 and A.2.	source of tunding.	
		or option I concerning unit costs	
		ind if the Beneficiary applies a	
	"UNIT COSTS CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICES":	nethodology not approved by the	
	IT IS CALCULATED BY DIVIDING THE TOTAL AMOUNT OF PERSONNEL COSTS OF THE CATEGORY TO WHICH THE	Commission:	
	EMPLOYEE BELONGS VERIFIED IN LINE WITH PROCEDURE A.1 BY THE NUMBER OF FTE AND THE ANNUAL TOTAL	(1) The unit costs re-calculated by	
	PRODUCTIVE HOURS OF THE SAME CATEGORY CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH PROCEDURE	the Auditor were the same as	
	A.2.	the rates applied by the	
		Beneficiary.	
		or option II concerning individual	
	IT IS CALCULATED BY DIVIDING THE TOTAL AMOUNT OF PERSONNEL COSTS OF AN EMPLOYEE VERIFIED IN LINE WITH	iourly rates:	

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Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	PROCEDURE A.1 BY THE NUMBER OF ANNUAL PRODUCTIVE HOURS VERIFIED IN LINE WITH PROCEDURE A.2.	32) The individual rates re- calculated by the Auditor were the same as the rates applied by the Beneficiary.	
A.4	TIME RECORDING SYSTEM To verify that the time recording system ensures the fulfilment of all minimum requirements and that the hours declared for the action were correct, accurate and properly authorised and supported by documentation, the Auditor made the following checks for the persons included in the sample that declare time as worked for the action on the basis of time records: o description of the time recording system provided by the Beneficiary (registration, authorisation, processing in the HR-system); o its actual implementation; o time records were signed at least monthly by the employees (on paper or electronically) and authorised by the project manager or another manager; o the hours declared were worked for the action if HR-records showed absence due to holidays or sickness (further cross-checks with travels are carried out in B.1 below) ;	 33) All persons recorded their time dedicated to the action on a daily/ weekly/ monthly basis using a paper/computerbased system. (delete the answers that are not applicable) 34) Their time-records were authorised at least monthly by the project manager or other superior. 35) Hours declared were worked within the project period and were consistent with the presences/absences recorded in HR-records. 	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	 the hours charged to the action matched those in the time recording system. 	36) There were no discrepancies	
	ONLY THE HOURS WORKED ON THE ACTION CAN BE CHARGED. ALL WORKING TIME TO BE CHARGED SHOULD BE RECORDED THROUGHOUT THE DURATION OF THE PROJECT, ADEQUATELY SUPPORTED BY EVIDENCE OF THEIR REALITY AND RELIABILITY (SEE SPECIFIC PROVISIONS BELOW FOR PERSONS WORKING EXCLUSIVELY FOR THE ACTION WITHOUT TIME RECORDS).	between the number of hours charged to the action and the number of hours recorded.	
	If the persons are working exclusively for the action and without time records		
	For the persons selected that worked exclusively for the action without time records, the Auditor verified evidence available demonstrating that they were in reality exclusively dedicated to the action and that the Beneficiary signed a declaration confirming that they have worked	37) The exclusive dedication is supported by a declaration signed by the Beneficiary's and by any other evidence	
	exclusively for the action.	gathered.	
в	COSTS OF SUBCONTRACTING		
B.1	The Auditor obtained the detail/breakdown of subcontracting costs and sampled <u>cost</u>	38) The use of claimed	
	items selected randomly (Jull coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is	foreseen in Annex 1 and costs were declared in the Financial	
	highest).	Statements under the	
	To confirm standard factual findings 38-42 listed in the next column, the Auditor reviewed the	subcontracting category.	

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	following for the items included in the sample:	39) There were documents of	
		requests to different	
	O THE USE OF SUBCONTRACTORS WAS FOR ESPENTIN ANNEX 1;	providers, different offers and	
	 subcontracting costs were declared in the subcontracting category of the Financial 	assessment of the offers	
	Statement;	before selection of the	
	\circ supporting documents on the selection and award procedure were followed;	provider in line with internal	
	$_{ m O}$ – the Beneficiary ensured best value for money (key elements to appreciate the respect of	rules Subcontracts were	
	this principle are the award of the subcontract to the bid offering best price-quality	awarded in accordance with	
	ratio, under conditions of transparency and equal treatment. In case an existing	the principle of best value for	
	framework contract was used the Beneficiary ensured it was established on the basis of	money.	
	the principle of best value for money under conditions of transparency and equal	(When different offers were	
		not collected the Auditor	
	In particular,	explains the reasons provided	
	i. If the Beneficiary acted as a contracting authority within the meaning of Directive	by the Beneficiary under the	
	2004/18/EC or of Directive 2004/17/EC, the Auditor verified that the applicable national	caption "Exceptions" of the	
	law on public procurement was followed and that the subcontracting complied with the	Report. The Commission will	
	Terms and Conditions of the Agreement.	analyse this information to	
	ii. if the Beneficiary did not fall under the above-mentioned category the Auditor verified	evaluate whether these costs	
	that the Beneficiary followed their usual procurement rules and respected the Terms and Conditions of the Agreement	might be accepted as eligible)	
	For the items included in the sample the Auditor also verified that:	40) The subcontracts were not	
	o the subcontracts were not awarded to other Beneficiaries in the consortium;	of the consortium.	

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Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	 there were signed agreements between the Beneficiary and the subcontractor; 	41) All subcontracts were	
	 there was evidence that the services were provided by subcontractor; 	supported by signed agreements between the	
		Beneficiary and the subcontractor.	
		42) There was evidence that the services were provided by the subcontractors.	
U	COSTS OF PROVIDING FINANCIAL SUPPORT TO THIRD PARTIES		
C.1	The Auditor obtained the detail/breakdown of the costs of providing financial support to third parties and sampled cost items selected randomly (full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest).		
	The Auditor verified that the following minimum conditions were met:	43) All minimum conditions were met	
	a) the maximum amount of financial support for each third party did not exceed EUR 60 000, unless explicitly mentioned in Annex 1;		
	b) the financial support to third parties was agreed in Annex 1 of the Agreement and the other provisions on financial support to third parties included in Annex 1 were		
	-	: - - -	Result
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Ket	Procedures	Standard factual finding	(C / E / N.A.)
	respected.		

۵	OTHER ACTUAL DIRECT COSTS	
D.1	COSTS OF TRAVEL AND RELATED SUBSISTENCE ALLOWANCES	14) Costs were incurred, approved
	The Auditor sampled cost items selected randomly (full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total whichever number is the highest).	and reimbursed in line with the Beneficiary's usual policy for travels.
	The Auditor inspected the sample and verified that:	45) There was a link between the trip and the action.
	 travel and subsistence costs were consistent with the Beneficiary's usual policy for travel. In this context, the Beneficiary provided evidence of its normal policy for travel costs (e.g. use of first class tickets, reimbursement by the Beneficiary on the basis of actual costs, a lump sum or per diem) to enable the Auditor to compare the travel costs charged with this policy; 	16) The supporting documents were consistent with each other regarding subject of the trip, dates, duration and
	 travel costs are correctly identified and allocated to the action (e.g. trips are directly linked to the action) by reviewing relevant supporting documents such as minutes of 	reconciled with time records and accounting.
	meetings, workshops or conferences, their registration in the correct project account, their consistency with time records or with the dates/duration of the workshop/conference;	 No ineligible costs or excessive or reckless expenditure was declared.
	 no ineligible costs or excessive or reckless expenditure was declared. 	
D.2	DEPRECIATION COSTS FOR EQUIPMENT, INFRASTRUCTURE OR OTHER ASSETS	18) Drocuramant rulas orincinlas
	The Auditor sampled cost items selected randomly (<i>full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the</i>	and guides were followed.
	total, whichever number is the highest).	19) There was a link between the
	For "equipment, infrastructure or other assets" [from now on called "asset(s)"] selected in the	grant agreement and the asset charged to the action.

Grant Agreement number: [insert number] [insert acronym] [insert call/sub-call identifier]

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 ample the Auditor verified that: the assets were acquired in conformity w procedures; they were correctly allocated to the action note invoice or any other proof demonstration they were entered in the accounting system they were entered in the assets were used for by reliable documentation (e.g. usage over by reliable rules in the Beneficiary's country and with policable rules in the Beneficiary's country and with the Auditor verified that no ineligible costs such as xcessive or reckless expenditure were declared (set the Auditor set that no ineligible costs such as the Auditor set that no ineligible costs such as the Auditor set that no ineligible costs such as the Auditor set that no ineligible costs such as the Auditor set that no ineligible costs such as the Auditor set that no ineligible costs such as the Auditor set that no ineligible costs such as the Auditor set that no ineligible costs such as the Auditor set that no ineligible costs such as the Auditor set that no ineligible costs such as the Auditor set that no ineligible costs such as the Auditor set that no ineligible costs such as the Auditor set that no ineligible costs such as the Auditor set that no ineligible costs such as the Auditor set that no ineligible costs such as the Auditor set than 10 items, otherwise the sample should the auditor set that no intervise the sample should the auditor set that no intervise the sample should the auditor set that no intervise the sample should the auditor set that no intervise the sample should the auditor set that no intervise the sample should the auditor set that no intervise the sample should the auditor set that no intervise the sample should the auditor set that no intervise the sample should the auditor set that no intervise the sample should the auditor set that no intervise the sample should the auditor set that no intervise the sample should the auditor set that no intervise the sample set that no intervise the sample set that no intervise the sample set that	50) The accet charged to the	ith the Beneficiary's internal guidelines and accounting records and the underlying documents.	(with supporting documents such as delivery 51) The depreciation method used ting the link to the action) to charge the asset to the	n; action was in line with the	or the action (as a percentage) was supported applicable rules of the Beneficiary's country and the Beneficiary's usual accounting	policy.	A verified that they were in line with the 52) The amount charged th the Beneficiary's usual accounting policy corresponded to the actual ue). usage for the action.	deductible VAT, exchange rate losses, 53) No ineligible costs or excessive ee Article 6.5 GA). declared.	andomly (full coverage is required if there are in Annex 1.	correct action and the goods
	samula tha Auditor varifiad that.	 the assets were acquired in conformity window procedures; 	 they were correctly allocated to the action note invoice or any other proof demonstrat 	 they were entered in the accounting system 	 the extent to which the assets were used fo by reliable documentation (e.g. usage overv 		The Auditor recalculated the depreciation costs and applicable rules in the Beneficiary's country and wit (e.g. depreciation calculated on the acquisition valu	The Auditor verified that no ineligible costs such as excessive or reckless expenditure were declared (se	COSTS OF OTHER GOODS AND SERVICES The Auditor sampled cost items selected ra	total, wnicnever number is nignest).

0	they were correctly identified, allocated to the proper action, entered in the accounting system (traceable to underlying documents such as purchase orders, invoices and accounting):	6) The costs were charged in line with the Beneficiary's accounting policy and were	
0	the goods were not placed in the inventory of durable equipment;	adequately supported.	
0	the costs charged to the action were accounted in line with the Beneficiary's usual accounting practices:	7) No ineligible costs or excessive or reckless expenditure were	
0	no ineligible costs or excessive or reckless expenditure were declared (see Article 6 GA).	declared. For internal invoices/charges only the cost	
In additi the Bene	ion, the Auditor verified that these goods and services were acquired in conformity with eficiary's internal guidelines and procedures, in particular:	element was charged, without any mark-ups.	
0	if Beneficiary acted as a contracting authority within the meaning of Directive 2004/18/EC or of Directive 2004/17/EC, the Auditor verified that the applicable national	8) Procurement rules, principles and guides were followed.	
_ /	law on public procurement was followed and that the procurement contract complied with the Terms and Conditions of the Agreement.	There were documents of requests to different	
C	if the Beneficiary did not fall into the category above the Auditor verified that the	providers, different offers and	
))	Beneficiary followed their usual procurement rules and respected the Terms and	assessment of the offers before selection of the	
-	Conditions of the Agreement.	provider in line with internal	
For the i	items included in the sample the Auditor also verified that:	procedures and procurement	
0	the Beneficiary ensured best value for money (key elements to appreciate the respect of	rules. The purchases were made in accordance with the	
	this principle are the award of the contract to the bid offering best price-quality ratio,	principle of best value for	
- 0	contract was used the Auditor also verified that the Beneficiary ensured it was	money.	
Ŷ	established on the basis of the principle of best value for money under conditions of	(When different offers were	
Ŧ	transparency and equal treatment);	not collected the Auditor	
SUCH GOC	ODS AND SERVICES INCLUDE, FOR INSTANCE, CONSUMABLES AND SUPPLIES, DISSEMINATION (INCLUDING	explains the reasons provided	
OPEN ACC	cess), PROTECTION OF RESULTS, SPECIFIC EVALUATION OF THE ACTION IF IT IS REQUIRED BY THE	by the Beneficiary under the	

Grant Agreement number: [insert number] [insert acronym] [insert call/sub-call identifier]

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caption "Exceptions" of the Report. The Commission will analyse this information to evaluate whether these costs might be accepted as eligible)	59) The costs declared as direct costs for Large Research Infrastructures (in the appropriate line of the Financial Statement) comply with the methodology described in the positive ex- ante assessment report.	50) Any difference between the methodology applied and the one positively assessed was extensively described and adjusted accordingly.	 The direct costs declared were free from any indirect costs items related to the Large Research Infrastructure.
AGREEMENT, CERTIFICATES ON THE FINANCIAL STATEMENTS IF THEY ARE REQUIRED BY THE AGREEMENT AND CERTIFICATES ON THE METHODOLOGY, TRANSLATIONS, REPRODUCTION.	AGGREGATED CAPITALISED AND OPERATING COSTS OF RESEARCH INFRASTRUCTURE The Auditor ensured the existence of a positive ex-ante assessment (issued by the EC Services) of the cost accounting methodology of the Beneficiary allowing it to apply the guidelines on direct costing for large research infrastructures in Horizon 2020. In the cases that a positive ex-ante assessment has been issued (see the standard factual	<i>findings 59-60 on the next column),</i> The Auditor ensured that the beneficiary has applied consistently the methodology that is explained and approved in the positive ex ante assessment;	<i>In the cases that a positive ex-ante assessment has NOT been issued</i> (<i>see the standard factual findings 61 on the next column</i>), The Auditor verified that no costs of Large Research Infrastructure have been charged as direct costs in any costs category;
	D.4		

	 In the cases that a draft ex-ante assessment report has been issued with recommendation for further changes (see the standard factual findings 61 on the next column). The Auditor followed the same procedure as above (when a positive ex-ante assessment has NOT yet been issued) and paid particular attention (testing reinforced) to the cost items for 		
ш	which the draft ex-ante assessment either rejected the inclusion as direct costs for Large Research Infrastructures or issued recommendations. USE OF EXCHANGE RATES		
E.1	a) For Beneficiaries with accounts established in a currency other than euros		
	The Auditor sampled cost items selected randomly and verified that the exchange rates used for converting other currencies into euros were in accordance with the following rules established in the Agreement (<i>full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest</i>): Costs incurrent in an another currency shall be converted in the European Union of 10 item, or 10% of the total, whichever number is highest): Costs incurrent in another currency shall be converted into euro at the European Union (If these is published in the Official Journal of the European Union (If these is published in the Official Journal of the European Union (If these is published in the Official Journal of the European Union (If these is published in the Official Journal of the European Union For the Currence for the Autor for the European Union For the Currence for the Monthly accounting rates currence of the Autor for the European Union For the Currence of the Monthly accounting rates for the Monthly and Early for the Counting rates for the Monthly accounting rates for the Counting rates for the Monthly accounting rates for the Monthly accounting rates for the Counties on the Monthly accounting rates for the Counties on the Monthly accounting rates for the Monther accountis for the Conthesis on the Monthly accountis for the Co	62) The exchange rates used to convert other currencies into Euros were in accordance with the rules established of the Grant Agreement and there was no difference in the final figures.	
	(<u>http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/inforeuro_en.cfm</u>),		

DETERMINED OVER THE CORRESPONDING REPORTING PERIOD.		
b) For Beneficiaries with accounts established in euros		
The Auditor sampled cost items selected randomly and verified that the exchange		
rates used for converting other currencies into euros were in accordance with the following		
rules established in the Agreement (<i>full coverage is required if there are fewer than 10 items</i> , 6;	33) The Beneficiary applied its	
otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number	usual accounting practices.	
is highest):		
COSTS INCURRED IN ANOTHER CURRENCY SHALL BE CONVERTED INTO EURO BY APPLYING THE BENEFICIARY'S USUAL		
ACCOUNTING PRACTICES.		

[legal name of the audit firm]

[name and function of an authorised representative]

[dd Month yyyy]

<Signature of the Auditor>

ANNEX 6

MODEL FOR THE CERTIFICATE ON THE METHODOLOGY

- > For options [*in italics in square brackets*]: choose the applicable option. Options not chosen should be deleted.
- > For fields in [grey in square brackets]: enter the appropriate data.

TABLE OF CONTENTS

INDEPENDENT REPORT OF FACTUAL FINDINGS ON THE METHODOLOGY CONCERNING GRANT AGREEMENTS FINANCED UNDER THE HORIZON 2020 RESEARCH AND INNOVATION FRAMEWORK PROGRAMME

Terms of reference for an audit engagement for a methodology certificate in connection with one or more grant agreements financed under the Horizon 2020 Research and Innovation Framework Programme

This document sets out the 'Terms of Reference (ToR)' under which

[OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')]

agrees to engage

[insert legal name of the auditor] ('the Auditor')

to produce an independent report of factual findings ('the Report') concerning the [Beneficiary's] [Linked Third Party's] usual accounting practices for calculating and claiming direct personnel costs declared as unit costs ('the Methodology') in connection with grant agreements financed under the Horizon 2020 Research and Innovation Framework Programme.

The procedures to be carried out for the assessment of the methodology will be based on the grant agreement(s) detailed below:

[title and number of the grant agreement(s)] ('the Agreement(s)')

The Agreement(s) has(have) been concluded between the Beneficiary and [OPTION 1: the European Union, represented by the European Commission ('the Commission')][OPTION 2: the European Atomic Energy Community (Euratom,) represented by the European Commission ('the Commission')][OPTION 3: the [Research Executive Agency (REA)] [European Research Council Executive Agency (ERCEA)] [Innovation and Networks Executive Agency (INEA)] [Executive Agency for Small and Medium-sized Enterprises (EASME)] ('the Agency'), under the powers delegated by the European Commission ('the Commission').].

The *[Commission]* [*Agency*] is mentioned as a signatory of the Agreement with the Beneficiary only. The *[European Union]* [*Euratom*] [*Agency*] is not a party to this engagement.

1.1 Subject of the engagement

According to Article 18.1.2 of the Agreement, beneficiaries [and linked third parties] that declare direct personnel costs as unit costs calculated in accordance with their usual cost accounting practices may submit to the [Commission] [Agency], for approval, a certificate on the methodology ('CoMUC') stating that there are adequate records and documentation to prove that their cost accounting practices used comply with the conditions set out in Point A of Article 6.2.

The subject of this engagement is the CoMUC which is composed of two separate documents:

- the Terms of Reference ('the ToR') to be signed by the [Beneficiary] [Linked Third Party] and the Auditor;
- the Auditor's Independent Report of Factual Findings ('the Report') issued on the Auditor's letterhead, dated, stamped and signed by the Auditor which includes; the standard statements ('the Statements') evaluated and signed by the [Beneficiary] [Linked Third Party], the agreed-upon procedures ('the Procedures') performed by the Auditor and the standard factual findings ('the Findings') assessed by the Auditor. The Statements, Procedures and Findings are summarised in the table that forms part of the Report.

The information provided through the Statements, the Procedures and the Findings will enable the Commission to draw conclusions regarding the existence of the [Beneficiary's] [Linked Third Party's] usual cost accounting practice and its suitability to ensure that direct personnel costs claimed on that basis comply with the provisions of the Agreement. The Commission draws its own conclusions from the Report and any additional information it may require.

1.2 Responsibilities

The parties to this agreement are the [Beneficiary] [Linked Third Party] and the Auditor.

The [Beneficiary] [Linked Third Party]:

- is responsible for preparing financial statements for the Agreement(s) ('the Financial Statements') in compliance with those Agreements;
- is responsible for providing the Financial Statement(s) to the Auditor and enabling the Auditor to reconcile them with the [Beneficiary's] [Linked Third Party's] accounting and bookkeeping system and the underlying accounts and records. The Financial Statement(s) will be used as a basis for the procedures which the Auditor will carry out under this ToR;
- is responsible for its Methodology and liable for the accuracy of the Financial Statement(s);
- is responsible for endorsing or refuting the Statements indicated under the heading 'Statements to be made by the Beneficiary/ Linked Third Party' in the first column of the table that forms part of the Report;
- must provide the Auditor with a signed and dated representation letter;
- accepts that the ability of the Auditor to carry out the Procedures effectively depends upon the [Beneficiary] [Linked Third Party] providing full and free access to the [Beneficiary's] [Linked Third Party's] staff and to its accounting and other relevant records.

The Auditor:

- [Option 1 by default: is qualified to carry out statutory audits of accounting documents in accordance with Directive 2006/43/EC of the European Parliament and of the Council of 17 May 2006 on statutory audits of annual accounts and consolidated accounts, amending Council Directives 78/660/EEC and 83/349/EEC and repealing Council Directive 84/253/EEC or similar national regulations].
- [Option 2 if the Beneficiary or Linked Third Party has an independent Public Officer: is a competent and independent Public Officer for which the relevant national authorities have established the legal capacity to audit the Beneficiary].
- [Option 3 if the Beneficiary or Linked Third Party is an international organisation: is an [internal] [external] auditor in accordance with the internal financial regulations and procedures of the international organisation].

The Auditor:

- must be independent from the Beneficiary [and the Linked Third Party], in particular, it must not have been involved in preparing the Beneficiary's [and Linked Third Party's] Financial Statement(s);
- must plan work so that the Procedures may be carried out and the Findings may be assessed;
- must adhere to the Procedures laid down and the compulsory report format;
- must carry out the engagement in accordance with these ToR;
- must document matters which are important to support the Report;
- must base its Report on the evidence gathered;
- must submit the Report to the [Beneficiary] [Linked Third Party].

The Commission sets out the Procedures to be carried out and the Findings to be endorsed by the Auditor. The Auditor is not responsible for their suitability or pertinence. As this engagement is not an assurance engagement the Auditor does not provide an audit opinion or a statement of assurance.

Grant Agreement number(s): [insert numbers and acronyms] Associated with document Ref. Ares(2016)5910251 - 13/10/2016

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1.3 Applicable Standards

The Auditor must comply with these Terms of Reference and with¹:

- the International Standard on Related Services ('ISRS') 4400 *Engagements to perform Agreed-upon Procedures regarding Financial Information* as issued by the International Auditing and Assurance Standards Board (IAASB);
- the *Code of Ethics for Professional Accountants* issued by the International Ethics Standards Board for Accountants (IESBA). Although ISRS 4400 states that independence is not a requirement for engagements to carry out agreed-upon procedures, the Commission requires that the Auditor also complies with the Code's independence requirements.

The Auditor's Report must state that there was no conflict of interests in establishing this Report between the Auditor and the Beneficiary [and the Linked Third Party] that could have a bearing on the Report, and must specify – if the service is invoiced - the total fee paid to the Auditor for providing the Report.

1.4 Reporting

The Report must be written in the language of the Agreement (see Article 20.7 of the Agreement).

Under Article 22 of the Agreement, the Commission, *[the Agency]*, the European Anti-Fraud Office and the Court of Auditors have the right to audit any work that is carried out under the action and for which costs are claimed from *[the European Union]* [*Euratom]* budget. This includes work related to this engagement. The Auditor must provide access to all working papers related to this assignment if the Commission, *[the Agency]*, the European Anti-Fraud Office or the European Court of Auditors requests them.

1.5 Timing

The Report must be provided by [dd Month yyyy].

¹ Supreme Audit Institutions applying INTOSAI-standards may carry out the Procedures according to the corresponding International Standards of Supreme Audit Institutions and code of ethics issued by INTOSAI instead of the International Standard on Related Services ('ISRS') 4400 and the Code of Ethics for Professional Accountants issued by the IAASB and the IESBA.

Grant Agreement number(s): [insert numbers and acronyms] Associated with document Ref. Ares(2016)5910251 - 13/10/2016

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1.6 Other Terms

[The [Beneficiary] [Linked Third Party] and the Auditor can use this section to agree other specific terms, such as the Auditor's fees, liability, applicable law, etc. Those specific terms must not contradict the terms specified above.]

[legal name of the Auditor]	[legal name of the [Beneficiary] [Linked Third Party]]
[name & title of authorised representative]	[name & title of authorised representative]
[dd Month yyyy]	[dd Month yyyy]
Signature of the Auditor Signature	Signature of the [Beneficiary] [Linked Third Party]

Independent report of factual findings on the methodology concerning grant agreements financed under the Horizon 2020 Research and Innovation Framework Programme

(To be printed on letterhead paper of the auditor)

То

[name of contact person(s)], [Position]

[[Beneficiary's] [Linked Third Party's] name]

[Address]

[dd Month yyyy]

Dear [Name of contact person(s)],

As agreed under the terms of reference dated [dd Month yyyy]

with [OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')],

we

[name of the auditor] ('the Auditor'),

established at

[full address/city/state/province/country],

represented by

[name and function of an authorised representative],

have carried out the agreed-upon procedures ('the Procedures') and provide hereby our Independent Report of Factual Findings ('the Report'), concerning the [Beneficiary's] [Linked Third Party's] usual accounting practices for calculating and declaring direct personnel costs declared as unit costs ('the Methodology').

You requested certain procedures to be carried out in connection with the grant(s)

[title and number of the grant agreement(s)] ('the Agreement(s)').

The Report

Our engagement was carried out in accordance with the terms of reference ('the ToR') appended to this Report. The Report includes: the standard statements ('the Statements') made by the [Beneficiary] [Linked Third Party], the agreed-upon procedures ('the Procedures') carried out and the standard factual findings ('the Findings') confirmed by us.

The engagement involved carrying out the Procedures and assessing the Findings and the documentation requested appended to this Report, the results of which the Commission uses to draw conclusions regarding the acceptability of the Methodology applied by the [Beneficiary] [Linked Third Party].

The Report covers the methodology used from [dd Month yyyy]. In the event that the [Beneficiary] [Linked Third Party] changes this methodology, the Report will not be applicable to any Financial Statement² submitted thereafter.

The scope of the Procedures and the definition of the standard statements and findings were determined solely by the Commission. Therefore, the Auditor is not responsible for their suitability or pertinence.

Since the Procedures carried out constitute neither an audit nor a review made in accordance with International Standards on Auditing or International Standards on Review Engagements, we do not

² Financial Statement in this context refers solely to Annex 4 of the Agreement by which the Beneficiary declares costs under the Agreement.

give a statement of assurance on the costs declared on the basis of the [Beneficiary's] [Linked Third Party's] Methodology. Had we carried out additional procedures or had we performed an audit or review in accordance with these standards, other matters might have come to its attention and would have been included in the Report.

Exceptions

Apart from the exceptions listed below, the [Beneficiary] [Linked Third Party] agreed with the standard Statements and provided the Auditor all the documentation and accounting information needed by the Auditor to carry out the requested Procedures and corroborate the standard Findings.

List here any exception and add any information on the cause and possible consequences of each exception, if known. If the exception is quantifiable, also indicate the corresponding amount.

•••••

Explanation of possible exceptions in the form of examples (to be removed from the Report):

i. the [Beneficiary] [Linked Third Party] did not agree with the standard Statement number ... because...;

ii. the Auditor could not carry out the procedure ... established because (e.g. due to the inability to reconcile key information or the unavailability or inconsistency of data);

iii. the Auditor could not confirm or corroborate the standard Finding number ... because

Remarks

We would like to add the following remarks relevant for the proper understanding of the Methodology applied by the [Beneficiary] [Linked Third Party] or the results reported:

Example (to be removed from the Report):

Regarding the methodology applied to calculate hourly rates ...

Regarding standard Finding 15 it has to be noted that ...

The [Beneficiary] [Linked Third Party] explained the deviation from the benchmark statement XXIV concerning time recording for personnel with no exclusive dedication to the action in the following manner: ...

Annexes

Please provide the following documents to the auditor and annex them to the report when submitting this CoMUC to the Commission:

- 1. Brief description of the methodology for calculating personnel costs, productive hours and hourly rates;
- 2. Brief description of the time recording system in place;
- 3. An example of the time records used by the [Beneficiary] [Linked Third Party];
- 4. Description of any budgeted or estimated elements applied, together with an explanation as to why they are relevant for calculating the personnel costs and how they are based on objective and verifiable information;
- 5. A summary sheet with the hourly rate for direct personnel declared by the [*Beneficiary*] [*Linked Third Party*] and recalculated by the Auditor for each staff member included in the sample (the names do not need to be reported);
- 6. A comparative table summarising for each person selected in the sample a) the time claimed by the [*Beneficiary*] [*Linked Third Party*] in the Financial Statement(s) and b) the time according to the time record verified by the Auditor;
- 7. A copy of the letter of representation provided to the Auditor.

Use of this Report

This Report has been drawn up solely for the purpose given under Point 1.1 Reasons for the engagement.

The Report:

- is confidential and is intended to be submitted to the Commission by the [*Beneficiary*] [*Linked Third Party*] in connection with Article 18.1.2 of the Agreement;
- may not be used by the [*Beneficiary*] [*Linked Third Party*] or by the Commission for any other purpose, nor distributed to any other parties;
- may be disclosed by the Commission only to authorised parties, in particular the European Anti-Fraud Office (OLAF) and the European Court of Auditors.
- relates only to the usual cost accounting practices specified above and does not constitute a report on the Financial Statements of the [*Beneficiary*] [*Linked Third Party*].

No conflict of interest³ exists between the Auditor and the Beneficiary [and the Linked Third Party] that could have a bearing on the Report. The total fee paid to the Auditor for producing the Report was EUR _________ (including EUR ________ of deductible VAT).

³ A conflict of interest arises when the Auditor's objectivity to establish the certificate is compromised in fact or in appearance when the Auditor for instance:

⁻ was involved in the preparation of the Financial Statements;

We look forward to discussing our Report with you and would be pleased to provide any further information or assistance which may be required.

Yours sincerely

[legal name of the Auditor]

[name and title of the authorised representative]

[dd Month yyyy]

Signature of the Auditor

- stands to benefit directly should the certificate be accepted;

⁻ has a close relationship with any person representing the beneficiary;

⁻ is a director, trustee or partner of the beneficiary; or

⁻ is in any other situation that compromises his or her independence or ability to establish the certificate impartially.

Statements to be made by the Beneficiary/Linked Third Party ('the Statements') and Procedures to be carried out by the Auditor ('the Procedures') and standard factual findings ('the Findings') to be confirmed by the Auditor

The Commission reserves the right to provide the auditor with guidance regarding the Statements to be made, the Procedures to be carried out or the Findings to be ascertained and the way in which to present them. The Commission reserves the right to vary the Statements, Procedures or Findings by written notification to the Beneficiary/Linked Third Party to adapt the procedures to changes in the grant agreement(s) or to any other circumstances.

If this methodology certificate relates to the Linked Third Party's usual accounting practices for calculating and claiming direct personnel costs declared as unit costs any reference here below to 'the Beneficiary' is to be considered as a reference to 'the Linked Third Party'.

Please explain any discrepancies in the body of the Re	port.		
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor		
A. Use of the Methodology	Procedure:		
 I. The cost accounting practice described below has been in use since [dd Month yyyy]. II. The next planned alteration to the 	 The Auditor checked these dates against the documentation the Beneficiary has provided. Factual finding: 		
methodology used by the Beneficiary will be from [dd Month yyyy].	 The dates provided by the Beneficiary were consistent with the documentation. 		
B. Description of the Methodology	Procedure:		
 III. The methodology to calculate unit costs is being used in a consistent manner and is reflected in the relevant procedures. [Please describe the methodology your entity uses to calculate personnel costs, productive hours and 	 The Auditor reviewed the description, the relevant manuals and/or internal guidance documents describing the methodology. Factual finding: 		
hourly rates, present your description to the Auditor and annex it to this certificate]	 The brief description was consistent with the relevant manuals, internal guidance and/or other documentary evidence the Auditor has reviewed. 		
[If the statement of section "B. Description of the methodology" cannot be endorsed by the Beneficiary or there is no written methodology to calculate unit costs it should be listed here below and reported as exception by the Auditor in the main Report of	 The methodology was generally applied by the Beneficiary as part of its usual costs accounting practices. 		

Please e	explain any discrepancies in the body of the Re	port.
Statem	ents to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
Factual	Findings:	
_]	
C. Pers	sonnel costs	Procedure:
<u>General</u>	L	The Auditor draws a sample of employees to carry out
IV.	The unit costs (hourly rates) are limited to salaries including during parental leave,	the procedures indicated in this section C and the following sections D to F.
	social security contributions, taxes and other costs included in the remuneration required under national law and the employment contract or equivalent appointing act;	[The Auditor has drawn a random sample of 10 full- time equivalents made up of employees assigned to the action(s). If fewer than 10 full-time equivalents are assigned to the action(s), the Auditor has selected a
V.	Employees are hired directly by the Beneficiary in accordance with national law, and work under its sole supervision and responsibility;	sample of 10 full-time equivalents consisting of all employees assigned to the action(s), complemented by other employees irrespective of their assignments.]. For this sample:
VI.	The Beneficiary remunerates its employees in accordance with its usual practices. This means that personnel costs are charged in line with the Beneficiary's usual payroll policy (e.g. salary policy, overtime policy, variable pay) and no special conditions exist for employees assigned to tasks relating to the European Union or Euratom, unless explicitly provided for in the grant agreement(s);	 the Auditor reviewed all documents relating to personnel costs such as employment contracts, payslips, payroll policy (e.g. salary policy, overtime policy, variable pay policy), accounting and payroll records, applicable national tax, labour and social security law and any other documents corroborating the personnel costs claimed;
VII.	The Beneficiary allocates its employees to the relevant group/category/cost centre for the purpose of the unit cost calculation in	employment contracts of the employees in the sample to verify that:
VIII.	Personnel costs are based on the payroll	Beneficiary in accordance with applicable national legislation;
IX.	Any exceptional adjustments of actual personnel costs resulted from relevant budgeted or estimated elements and were based on objective and verifiable information. [Please describe the 'budgeted or estimated elements' and their relevance to personnel costs, and explain how they were reasonable and based on objective and verifiable information, present your explanation to the Auditor and annex it to this certificate].	 ii. they were working under the sole technical supervision and responsibility of the latter; iii. they were remunerated in accordance with the Beneficiary's usual practices; iv. they were allocated to the correct group/category/cost centre for the purposes of calculating the unit cost in line with the Beneficiary's usual cost accounting practices; ✓ the Auditor verified that any ineligible items
Х.	Personnel costs claimed do not contain any of the following ineligible costs: costs related to return on capital; debt and debt service charges; provisions for future losses	or any costs claimed under other costs categories or costs covered by other types of grant or by other grants financed from the European Union budget have not been taken

Please e	explain any discrepancies in the body of the Re	port.
Stateme	ents to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
XI.	or debts; interest owed; doubtful debts; currency exchange losses; bank costs charged by the Beneficiary's bank for transfers from the Commission/Agency; excessive or reckless expenditure; deductible VAT or costs incurred during suspension of the implementation of the action. Personnel costs were not declared under another EU or Euratom grant (including grants awarded by a Member State and financed by the EU budget and grants awarded by bodies other than the Commission/Agency for the purpose of implementing the EU budget).	 into account when calculating the personnel costs; ✓ the Auditor numerically reconciled the total amount of personnel costs used to calculate the unit cost with the total amount of personnel costs recorded in the statutory accounts and the payroll system. ✓ to the extent that actual personnel costs were adjusted on the basis of budgeted or estimated elements, the Auditor carefully examined those elements and checked the information source to confirm that they correspond to objective and verifiable information;
<u>If additii</u> agreem XII. XIII.	onal remuneration as referred to in the grant ent(s) is paid The Beneficiary is a non-profit legal entity; The additional remuneration is part of the beneficiary's usual remuneration practices and paid consistently whenever the relevant	 the Auditor verified that the Beneficiary was a non-profit legal entity, that the amount was capped at EUR 8000 per full-time equivalent and that it was reduced proportionately for employees not assigned exclusively to the action(s). the Auditor recalculated the personnel costs for the employees in the sample.
XIV.	work or expertise is required; The criteria used to calculate the additional remuneration are objective and generally applied regardless of the source of funding:	4. All the components of the remuneration that have been claimed as personnel costs are
XV.	The additional remuneration included in the personnel costs used to calculate the hourly rates for the grant agreement(s) is capped at EUR 8 000 per full-time equivalent (reduced proportionately if the employee is not assigned exclusively to the action).	 supported by underlying documentation. 5. The employees in the sample were employed directly by the Beneficiary in accordance with applicable national law and were working under its sole supervision and responsibility. 6. Their employment contracts were in line with the Beneficiary's usual policy;
		 Personnel costs were duly documented and consisted solely of salaries, social security contributions (pension contributions, health insurance, unemployment fund contributions, etc.), taxes and other statutory costs included in the remuneration (holiday pay, thirteenth month's pay, etc.);
[If certa costs" co should b exceptic	in statement(s) of section "C. Personnel annot be endorsed by the Beneficiary they be listed here below and reported as on by the Auditor in the main Report of	 8. The totals used to calculate the personnel unit costs are consistent with those registered in the payroll and accounting records; 9. To the extent that actual personnel costs were adjusted on the basis of budgeted or estimated elements, those elements were

Please explain any discrepancies in the body of the Re	port.
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
Factual Findings:]	 relevant for calculating the personnel costs and correspond to objective and verifiable information. The budgeted or estimated elements used are: — (indicate the elements and their values). 10. Personnel costs contained no ineligible elements; 11. Specific conditions for eligibility were fulfilled when additional remuneration was paid: a) the Beneficiary is registered in the grant agreements as a non-profit legal entity; b) it was paid according to objective criteria generally applied regardless of the source of funding used and c) remuneration was capped at EUR 8000 per full-time equivalent (or up to up to the equivalent pro-rata amount if the person did not work on the action full-time during the year or did not work exclusively on the action).
 D. Productive hours XVI. The number of productive hours per full- time employee applied is [delete as appropriate]: A. 1720 productive hours per year for a person working full-time (corresponding pro-rata for persons not working full time). B. the total number of hours worked in the year by a person for the Beneficiary C. the standard number of annual hours generally applied by the beneficiary for its personnel in accordance with its usual cost accounting practices. This number must be at least 90% of the standard annual workable hours. 	 Procedure (same sample basis as for Section C: Personnel costs): ✓ The Auditor verified that the number of productive hours applied is in accordance with method A, B or C. ✓ The Auditor checked that the number of productive hours per full-time employee is correct and that it is reduced proportionately for employees not exclusively assigned to the action(s). ✓ If method B is applied the Auditor verified i) the manner in which the total number of hours worked was done and ii) that the contract specified the annual workable hours by inspecting all the relevant documents, national legislation, labour agreements and contracts.
XVII. The calculation of the total number of hours worked was done as follows: annual workable hours of the person according to the employment contract, applicable labour agreement or national law plus overtime worked minus absences (such as sick leave and special leave). XVIII. 'Annual workable hours' are hours	✓ If method C is applied the Auditor reviewed the manner in which the standard number of working hours per year has been calculated by inspecting all the relevant documents, national legislation, labour agreements and contracts and verified that the number of productive hours per year used for these calculations was at least 90% of the standard number of working hours per year.

Please explain any discrepancies in the body of the Report.		
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be	
	confirmed by the Auditor	
 during which the personnel must be working, at the employer's disposal and carrying out his/her activity or duties under the employment contract, applicable collective labour agreement or national working time legislation. XIX. The contract (applicable collective labour agreement or national working time legislation) do specify the working time enabling to calculate the annual workable hours. <u>If method C is applied</u> XX. The standard number of productive hours per year is that of a full-time equivalent; for employees not assigned exclusively to the action(s) this number is reduced proportionately. XXI. The number of productive hours per year on which the hourly rate is based i) corresponds to the Beneficiary's usual accounting practices; ii) is at least 90% of the standard number of workable (working) hours per year. XXII. Standard workable (working) hours are hours during which personnel are at the Beneficiary's disposal preforming the duties described in the relevant employment contract, collective labour agreement or national labour legislation. The number of standard annual workable (working) hours that the Beneficiary claims is supported by 	 Factual finding: <u>General</u> 12. The Beneficiary applied a number of productive hours consistent with method A, B or C detailed in the left-hand column. 13. The number of productive hours per year per full-time employee was accurate and was proportionately reduced for employees not working full-time or exclusively for the action. <u>If method B is applied</u> 14. The number of 'annual workable hours', overtime and absences was verifiable based on the documents provided by the Beneficiary and the calculation of the total number of hours worked was accurate. 15. The contract specified the working time enabling to calculate the annual workable hours. <u>If method C is applied</u> 16. The calculation of the standard number of workable (working) hours per year was corroborated by the documents presented by the Beneficiary. 17. The calculation of the standard number of workable (working) hours per year was corroborated by the documents presented by the Beneficiary. 18. The number of productive hours per year used for the calculation of the number of workable 	
 labour contracts, national legislation and other documentary evidence. [If certain statement(s) of section "D. Productive hours" cannot be endorsed by the Beneficiary they should be listed here below and recented and 	(working) hours per year.	
exception by the Auditor:		
]		
E. Hourly rates	Procedure	
The hourly rates are correctly calculated since	 The Auditor has obtained a list of all personnel rates calculated by the Beneficiary in accordance with the methodology used. The Auditor has obtained a list of all the 	
they result from dividing annual personnel	relevant employees, based on which the	

Please explain any discrepancies in the body of the Report.		
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor	
costs by the productive hours of a given year and group (e.g. staff category or department or cost centre depending on the methodology applied) and they are in line with the statements made in section C. and D. above.	personnel rate(s) are calculated. For 10 full-time equivalent employees selected at random (same sample basis as Section C: Personnel costs):	
[If the statement of section 'E. Hourly rates' cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor:]	 ✓ The Auditor recalculated the hourly rates. ✓ The Auditor verified that the methodology applied corresponds to the usual accounting practices of the organisation and is applied consistently for all activities of the organisation on the basis of objective criteria irrespective of the source of funding. Factual finding: No differences arose from the recalculation of the hourly rate for the employees included in the sample. 	
F. Time recording	Procedure	
XXIV. Time recording is in place for all persons with no exclusive dedication to one Horizon 2020 action. At least all hours worked in connection with the grant agreement(s) are registered on a daily/weekly/monthly basis	 The Auditor reviewed the brief description, all relevant manuals and/or internal guidance describing the methodology used to record time. 	
paper/computer-based system [delete as appropriate];	The Auditor reviewed the time records of the random sample of 10 full-time equivalents referred to under	
XXV. For persons exclusively assigned to one Horizon 2020 activity the Beneficiary has either signed a declaration to that effect or has put arrangements in place to record their working time;	 Section C: Personnel costs, and verified in particular: ✓ that time records were available for all persons with not exclusive assignment to the action; 	
 XXVI. Records of time worked have been signed by the person concerned (on paper or electronically) and approved by the action manager or line manager at least monthly; XXVII. Measures are in place to prevent staff from: 	✓ that time records were available for persons working exclusively for a Horizon 2020 action, or, alternatively, that a declaration signed by the Beneficiary was available for them certifying that they were working exclusively	
i. recording the same hours twice, ii. recording working hours during absence periods (e.g. holidays, sick	for a Horizon 2020 action; ✓ that time records were signed and approved in due time and that all minimum requirements were fulfilled;	
leave), iii. recording more than the number of productive hours per year used to calculate the hourly rates, and	 ✓ that the persons worked for the action in the periods claimed; ✓ that no more hours were claimed than the productive hours used to calculate the hourly 	

Please explain any discrepancies in the body of the Report.		
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor	
iv. recording hours worked outside the	personnel rates;	
XXVIII. No working time was recorded outside the action period;XXIX. No more hours were claimed than the productive hours used to calculate the hourly personnel rates.	✓ that internal controls were in place to prevent that time is recorded twice, during absences for holidays or sick leave; that more hours are claimed per person per year for Horizon 2020 actions than the number of productive hours per year used to calculate the hourly rates; that working time is recorded outside the action period;	
[Please provide a brief description of the <u>time</u> <u>recording system</u> in place together with the measures applied to ensure its reliability to the Auditor and annex it to the present certificate ⁴].	✓ the Auditor cross-checked the information with human-resources records to verify consistency and to ensure that the internal controls have been effective. In addition, the Auditor has verified that no more hours were charged to Horizon 2020 actions per person per year than the number of productive hours per year used to calculate the hourly rates, and verified that no time worked outside the action period was charged to the action	
[If certain statement(s) of section "F. Time	Eactual finding:	
they should be listed here below and reported as exception by the Auditor:	 20. The brief description, manuals and/or internal guidance on time recording provided by the Beneficiary were consistent with management reports/records and other documents reviewed and were generally applied by the Beneficiary to produce the financial statements. 	
	 For the random sample time was recorded or, in the case of employees working exclusively for the action, either a signed declaration or time records were available; 	
	22. For the random sample the time records were signed by the employee and the action manager/line manager, at least monthly.	
	 Working time claimed for the action occurred in the periods claimed; 	
	24. No more hours were claimed than the number productive hours used to calculate the hourly	

⁴ The description of the time recording system must state among others information on the content of the time records, its coverage (full or action time-recording, for all personnel or only for personnel involved in H2020 actions), its degree of detail (whether there is a reference to the particular tasks accomplished), its form, periodicity of the time registration and authorisation (paper or a computer-based system; on a daily, weekly or monthly basis; signed and countersigned by whom), controls applied to prevent double-charging of time or ensure consistency with HR-records such as absences and travels as well as it information flow up to its use for the preparation of the Financial Statements.

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
	 personnel rates; 25. There is proof that the Beneficiary has checked that working time has not been claimed twice, that it is consistent with absence records and the number of productive hours per year, and that no working time has been claimed outside the action period. 26. Working time claimed is consistent with that on record at the human-resources department.

[official name of the [Beneficiary] [Linked Third	[official name of the Auditor]
Party]]	
[name and title of authorised representative]	[name and title of authorised representative]
[dd Month yyyy]	[dd Month yyyy]
< Signature of the [Beneficiary] [Linked Third Party]>	< Signature of the Auditor>