

**Czech Development agency**

**Enhancing capacity of junior geoscience professionals working in governmental offices (Federal Democratic Republic of Ethiopia)**

Prepared by:

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**Applicant:**

Geological Survey of Ethiopia

P.O. Box 2302, Addis Ababa,

Ethiopia.

**Partner Institution:**

Czech Geological Survey

Klárov 3, Prague 1

Czech Republic, European Union

**Estimated Area of Expertise:**

The Czech Geological Survey is the sole organization in the Czech Republic for the carrying out of geological mapping, exploration and discovery of mineral deposits as well as the management of the extensively generated and collected geological information systems. Since its establishment in 1919 it has developed into a prestigious organization and research centre for geoscience related mapping in Central Europe. Furthermore, a number of successful co-operations have been realized under the framework of the Foreign Development Cooperation programme of the Czech Republic in Nicaragua, Costa Rica, El Salvador, Peru, Zambia, Namibia, Burkina Faso, Mongolia and also in some parts of Ethiopia. In the process, methodologies, advanced techniques and skills have been developed that can be of paramount importance for potential partners worldwide, especially in the developing world where such means are very limited. The experiences and skills accumulated in the Czech Geological Survey will be an asset to share with and help developing nations to handle the utilization and management of their natural resources efficiently and effectively. In addition, some of the experts at the Czech Geological Survey have affiliations with various institutes and universities which is a further asset in the training process of the applicant institute, the Geological Survey of Ethiopia.

**Expected Start and End Dates:**

1st September 2016 to 30th November 2018

**Total Amount of Days in the Field:**

7-14 days of work for 3 experts each per year (35-42 days each year in total)

Total of 112 days over the three years.

The duration is counted by considering two factors. First is the fact that the topics which need to be covered in the first year (2016) are related to the use of sophisticated software and datasets which are normally available (mostly freely) but not utilized by the professionals (trainees) based on our communication with the applicant institute. This requires that sufficient time be allotted for effective demonstration and enabling trainees to use the software, datasets and be able to interpret relevant information. The second factor is that in the trainings planned for the years 2017 and 2018, mobilization to remote areas will be required to reach model areas for effective demonstration of the various skills in the field. Hence, the extended dates are assumed to compensate for the reason that the trainees will be able to deliver full and meaningful training counting with travelling times to and from the training sites and also meeting the time requirement to address the contents of the training.

**Expected Applicants’ Institution Type of Cooperation:**

Processing of permits and licenses: Selection, invitation and coordination of trainees (participants), provision of logistics for field and practice training (in particular, cars including fuel, field logistics, camping facilities, stationary expenses, sufficient space and equipment for in-house, existing sample analysis and preparation facility, office space for Czech experts, existing geological and topographic maps as well as any relevant map and satellite data at the disposal of the GSE for the training areas). It is also presumed that the GSE will cover the basic expenses of its trainees during the program and will also avail senior experts to support the training during lecture and field work. Regional offices and federal organizations would also avail relevant professionals covering their basic expenses during the training.

C**ontext:**

The current situation shows that the government has faced difficulties in retaining senior professionals in the geoscience field due to blooming of private sector investment in Ethiopia. This unfortunately has returned the problem that the government is not able to keep the capacity to render extensive service to the industry and development of infrastructure required for progress in the country. The effective solution could be to upgrade and enhance the capacity of young and junior professionals mainly by intensive short term in-country training. The role of this project is to transfer up to date state of knowledge in applied geosciences in a well-structured and sustainable manner for key professionals of government offices.

The three-year training will be held every year (in October to November from 2016 to 2018). During this time the applicant Institute’s staff as well as other institutes’ junior geoscience professionals including several regional offices of mineral and natural resources, federal organizations such as Ministry of Mines, Petroleum and Natural Gas, Ministry of Water, Irrigation and Energy, Ethiopian Roads Authority (Infrastructure development planning unit), will take part in the training. The proposed timing for the training is selected between October and November so the availability of all staff can be ensured. In the training both theoretical and practical exercises will be addressed with the emphasis on the practical usage of acquired knowledge. To the effect of the short in-house lectures focusing on current scientific knowledge, development and new methodological approach in geoscience will be presented. Lectures will be implemented through Czech experts based on practical education and field work including data collection and processing. This multidisciplinary approach will include processing of remote sensing data, an introduction to geological mapping and mineral resources investigation and geo-hazard assessment. Evaluation of skills will be tested at the beginning and end of each training season. For more details see the expected time schedule.

**Expected Outcomes and Results by the Applicant:**

(a) Practical skills of public sector geoscience professionals with junior level of experience are enhanced. (Indicator: Sets of tests and questionnaires will be prepared in the form of check lists for all participants and this will be used as base data for comparison with the assessment tests and questionnaires related to the training at the end of each training.)

(b) Basic geoscience data generation, interpretation, archiving and administration methodology is established. (Indicator: Sets of tests and questionnaires will be prepared in the form of check lists for all participants and this will be used for comparison as base data with the assessment tests and questionnaires related to the contents of the training at the end of each training).

(c) Geo-scientific aspects of selected (prioritized) areas by GSE (Geological Survey of Ethiopia) will be investigated for geo-hazard risks, economic geology and geological set-up in the training process. (Indicator: Produced maps and explanatory booklet for the areas where the field training were carried out at the end of the third year training season)

**Expected time schedule**:

**First year of the project (2016)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Subject**  | **Location** | **Number of Trainees** | **Amount of work for experts** |
| October to November 2016 | Training in Geographic Information Systems (GIS) and Remote Sensing (RS), with special emphasis on application for geological and resources mapping.Introduction of geological mapping principles and current techniques.  | Addis Ababa, Ethiopia | 20 participants | 35 days of work in total (including travelling) |

Preliminary programme (first year): Methods of geological mapping. Introduction to ArcGIS and import of the field data to ArcGIS system. Introduction to raster data, raster symbology, georeferencing. Raster analysis, interpolation of geochemical/geophysical maps from point data. Digital elevation models (DEMs), numerical geomorphology and morph tectonic analysis, introduction to vector data editing. Hydrological modelling. Advanced image analysis – decorrelation stretch, principal component analysis, image classification (ENVI). 3D surfaces, TIN, 3D visualizations, hydrogeological analysis in 3D. Exercise for proving learned skills.

**Second year of the project (2017)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Subject**  | **Location** | **Number of Trainees** | **Amount of work for experts** |
| October to November 2017 | Field geological mapping training and data collection including mineral resources exploration and field geophysicsGeological data collection, making field notes and sketches, identification of rock and minerals types, orientations of planar and linear features in rocks, identification of hydrothermal alterations, geologic map preparation, stratigraphic section and cross-section construction, and interpretation of GPS datasets. Geophysical prospection (geoelectrical and seismic methods) – from the planning phase through field measurements up to data processing, inversion and interpretation. | Tekeze, Ethiopia | 20 participants | 42 days of work in total (including travelling) |

Preliminary programme (second year): An introduction to geological mapping and field data processing (field geological documentation, description of rocks, minerals and hydrothermal alteration; analysis of ductile, brittle-ductile and brittle structures, sampling and construction of geological map and interpretative cross-sections. Basic features and methods of geochemical and mineral resources exploration. Selection of suitable exploration field trips (based on existing data from base geological mapping and airborne survey and remote sensing). Practice in litho-geochemistry, whole rock analyses, heavy mineral distribution, preparation of heavy mineral concentrates, stream sediment geochemistry, soil sampling, hydro-geochemical survey and biogeochemical prospecting). Preparation of final report and maps with exploration results. Geophysical prospection (geoelectrical and seismic methods) from the planning phase through field measurements up to data processing, inversion and interpretation.

**Third year of the project (2018)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Subject**  | **Location** | **Number of Trainees** | **Amount of work for experts** |
| October 2018 | Geo-hazards risk and tectonics | Hosaina, Ethiopia | 20 participants | 35 days of work for total (including travelling) |

Preliminary programme (third year): And introduction to applied geomorphology and brittle tectonics with main focus on analysis of geological risks. Classification of basic geomorphological forms and exogenous processes and their genesis in terrestrial settings, processes and types of slopes deformation and mass-movement, evolution and processes of alluvial systems and principles in elaborating applied geomorphologic and maps of susceptibility to geological risks. An introduction to brittle tectonics, classification of joins and faults, kinematics with special reference to continental rift structure.

**Team members:**

**Kryštof Verner**, Assoc. Prof., Ph.D

Structural and mapping geologist working for Czech Geological Survey (full-time position) and Charles University in Prague. His main focus is field-oriented research in structural geology, tectonics, interplay between magmatic and tectonic processes and geological mapping in the European Variscides area, Sierra Nevada in the north-western United States and Ethiopia (coordinator of the project; lecturer). His training is scheduled for 20 participants for the year 2018. The training will be introducing structural mapping methods and advances in geological research mainly focusing on tectonics related to geo-hazards.

**Karel Martínek**, Ph.D

Sedimentary geologist and expert in tectonic geomorphology, thermochronology, geoinformation systems and remote sensing in geology with extensive teaching experience at Charles University, Prague (lecturer, responsible person for the first year of training). His training is scheduled for 20 participants in the year 2016. The training will be on Geographic Information System (GIS), Remote Sensing (RS) applications in geo-science fields and introducing to geological mapping principles.

**David Buriánek**, Ph.D

Petrologist and mapping geologist at the Czech Geological Survey and the Masaryk University in Brno. His main focus is mineralogy, petrology and geochemistry of igneous and metamorphic rocks and geological mapping. (lecturer, responsible person for the second year of training). His training is scheduled for 10 participants in the year 2017. The trainees in the year 2017 will be split into two groups for sake of practicality and trained in parallel by two experts of similar qualification. The training will be focused on the field of geological mapping and mineral resources exploration.

**Petr Bohdálek**, MSc

Geochemist and exploration geologist at the Czech Geological Survey with wide experiences in mineral resources exploration and field geological mapping (lecturer). His training is scheduled for 10 participants in the year 2017. The trainees in the year 2017 will be split into two groups for sake of practicality and trained in parallel by two experts of similar qualification. The training will be focused on the field of geological mapping and mineral resources exploration.

**Tomáš Hroch**, MSc

Senior Geologist currently employed by the Czech Geological Survey. He has 10 years of extensive experience in the sedimentary geology and geomorphology, geological and geomorphological mapping projects, studies of natural hazards, interpretation of Remote Sensing data (aerial photos and LIDAR), and elaboration of thematic maps in GIS (lecturer, responsible person for the third year of training). His training is scheduled for 20 participants in the year 2018. The training will be on geomorphological mapping methods for geo-hazards and geo-hazards risk analysis techniques.

**Leta Alemayehu Megerssa**, MSc

Engineering geologist and structural geologist working on development projects between the Czech Republic and Ethiopia. As a former employee of the Geological Survey of Ethiopia he has good acquaintance with the geo-science organizations and offices in Ethiopia therefore his role will be to ensure that the trainings will be according to the need of the applicant organization as close and frequent communication is necessary to effectively deliver the required subject for the applicant. Also his local knowledge of the study areas and help in facilitation of local bureaucracy will be essential for successful implementation of the project. His role will be the coordination of 20 participants of the training and experts from Czech Republic as well as taking care of local bureaucratic matters with support of the applicant institute, the Geological Survey of Ethiopia. To facilitate effective utilization of time to implement smooth delivery of training in tight schedules for field works in remote sites and in directing daily implementation of in house training in the first year.

**Jan Jelének,** MSc.

Remote sensing and 3D modelling specialist working for Czech Geological Survey (lecturer). The role will be to engage in consultations with participants in practising the remote sensing and GIS applications during the training process, as one person cannot effectively address all issues that arise. 20 participants will be addressed.

**Jan Valenta,** Ph.D

Research assistant at Charles University at Prague, Czech Republic and also research worker at the Institute of Rock Structure and Mechanics, Academy of Sciences of the Czech Republic. His main scientific interest is high-resolution near surface geophysical prospection combining several geophysical methods, mainly geoelectrical, seismic and gravity measurements. The training will be focused on the practical application of geophysical methods during geological mapping and mineral resources exploration.

**Petra Hejtmanková**, MSc

She is an employee at the Czech Geological Survey as the specialist for Geographic Information Systems (ArcGIS – ESRI). Digitizing, editing and creating geological maps (lecturer). The role will be to engage in consultations with participants in practising the remote sensing and GIS applications during the training process, as one person cannot effectively address all issues that arise. 20 participants will be addressed.

**Expected Amount of Work in Total:**

A total of 77 days of work in field for the three years from 2016 to 2018 with training given to 20 – 25 trainees each year.

2016 – total: 35 days of work in lecture room (GSE)

2017 – total: 42 days of work in field

2018 – total: 35 days of work in field

**Amount of Work per Expert in Total:**

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Expert** | **Duration** | **Number of Trainees** |
| 1 | **Kryštof Verner** | 14 days in 2018 | 20  |
| 2 | **Karel Martínek** | 14 Days in 2016 | 20 |
| 3 | **Tomáš Hroch** | 14 days in 2018 | 20 |
| 4 | **David Buriánek** | 14 days in 2017 | 20 |
| 5 | **Petr Bohdálek** | 14 days in 2017 | 20 |
| 6 | **Petra Hejtmanková** | 7 days in 2016 | 20 |
| 7 | **Jan Jelének** | 7 days in 2016 | 20 |
| 8 | **Leta Alemayehu Megerssa** | 7 days in 2016, 2017, 2018 | 20 |
| 9 | **Jan Valenta** | 7 days in 2017 | 20 |

**Amount of Work per Team in Total:**

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Team** | **Duration** | **Number of participants** |
| 1 | Training on Geographic Information System (GIS) and Remote Sensing (RS) and an introduction to geological mapping - principles and current techniques.  | 28 days in October / November 2016 | 20  |
| 2 | Field geological mapping and mineral resources exploration. | 28 days in October / November 2017 | 20  |
| 3 | Geo-hazards risk and brittle tectonics | 28 days in October / November 2018 | 20  |

**Funding:**

Attached in Annex III of the Contract. A slight increment of the budget has been made due to the incorporation of additional expert who will be responsible for the coordination and facilitation of the training process.

**Complementarity:**

So far endeavours have been made in the form of collaboration on studies for the purpose of carrying out normal study procedures with the intent of transferral of necessary skills and knowledge in the process. But due to the requirement to know the study areas during the project implementation which are usually short to extensively undertake the skill transfer aspect, the level of skill transfer has not been well addressed. Also the continued turnover of the few well affiliated project participants from partner organizations soon created similar gaps in capacity of the institutes to fully deliver their goal. Hence, the emphasis in this case is more on training and capacity building rather than the working on physical outputs which is regarded to be more effective with the proposed intensive and cyclical approach of training. Some of the previously implemented activities in the above context are listed below. Also the interventions in the previous cases were focused only on environmental protection and groundwater resources while basic geological understanding and economic mineral resources evaluation and administration at regional levels and at the geological survey have not been considered where the sector is suffering a huge gap as well.

Japan International Cooperation Agency (JICA)

* Landslide Investigation for development of Counter measure in the Blue Nile River section of the Main Trunk road from Addis Ababa to Bahir Dar towns (2010-2012).

Czech Republic Development Cooperation

* Capacity development in environmental geology - mapping of geo-hazards including hydrogeological conditions in the regions of Dila and Hosaina, Ethiopia", which was implemented in the years 2012 - 2014 by Czech Geological Survey in cooperation with Aquatest Company a.s and the GSE.
* Analysis of natural risks affecting agricultural production in selected areas of Southern Nations Nationalities and People’s Region (SNNPR), Ethiopia, by Czech Geological Survey (2015 – 2017).
* Hydrogeological and hydrochemical mapping of Ethiopia (2015 – 2019).
* Establishment of Seismic Monitoring Station in Shashemene in cooperation with Aquatest Company a. s. (2015)
* Capacity Building in the Field of Engineering Geology and Hydrogeology (2010 – 2012)
* Capacity Building in Management of Environmental Data (2013)