



GEO-CRADLE REGIONAL EVENT ACCESS TO RAW MATERIALS

MOROCCO & ALGERIA
17-23 OCTOBER 2016



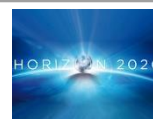
GEO-CRADLE: Coordinating and integrating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East, and Balkans and Developing Links with GEO related initiatives towards GEOSS

Addressing GEO-CRADLE regional challenges - Access to raw materials

MINUTES



The GEO-CRADLE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690133.





Objective & Outline:

GEO-CRADLE has proactively engaged and keeps engaging with the relevant regional stakeholders (data/service providers, decision makers, and SMEs) in a series of consultation activities including surveys, interviews, workshops and bilateral exchanges, in order to identify the regional needs. After a first in-depth analysis of their feedback which was presented in the GEO-CRADLE meeting in Novisad, Serbia, GEO-CRADLE is now going to make a concrete first step through the 4 pilot/feasibility studies towards addressing the identified gaps and needs in relation to common regional challenges by creating the appropriate ecosystem, building the necessary toolbox, and providing a first tangible outcome.

The objective of the pilot activities is not to develop new science, but to build on the integration of existing capacities (infrastructure, datasets, models, etc.) and skills within the relevant group of project partners that are involved towards the provision of improved EO Services in the Region of Interest (RoI). The pilots will span a period of 15 months, and the final results will be presented to relevant stakeholders (especially decision makers) in a dedicated workshop.

The GEO-CRADLE pilot activities are the following:

- 1) Adaptation to Climate Change (T4.1, Leader: NOA)
- 2) Improved Food Security – Water Extremes Management (T4.2, Leader: IBEC)
- 3) Access to Raw Material (T4.3, Leader: EGS)
- 4) Access to Energy (T4.4, Leader: PMOD/WRC)

The objective of the GEO-CRADLE Regional Events which took place on 17-23 October 2016 in Morocco & Algeria, was to analyze and discuss in detail the proposed refined scope of the pilot activity T4.3 (Access to Raw Material), on the basis of the gap analysis (WP3) and other inputs from partners; thus preparing the ground for the final decisions on their refined scope during the Project Meeting which will take place on 17 November in Limassol, Cyprus.

Bringing together local and regional in-situ network operators and Geological Surveys representatives, the events provided project partners and stakeholders with valuable knowledge on the identified regional EO capacities and skills, as well as the challenges in the domain of access to raw materials, and contributed to the refinement of the scope of the relevant GEO-CRADLE pilot activity that will focus on the access to raw materials in the regions of Balkans, Middle East and North Africa, to the extent that this can be supported by GEO, GEOSS, and Copernicus. The meetings were in line with the objectives of PanAfGeo, Copernicus (GMES and Africa), and the new GEO Energy and Minerals Societal Benefit Area.



2nd EGS Networking event “Aimed at in-situ network operators and Geological Surveys – especially in Middle East and North Africa”, 17 October 2016, Rabat, Morocco

The meeting was co-organized by the Geological Survey of Morocco and EuroGeoSurveys (EGS), and was hosted by the Minister of Energy, Mining, Water and Environment of the Kingdom of Morocco. It was attended by over 40 participants representing the GeoScience Community in Morocco, including universities and government institutions at high level, 10 Geological Surveys and GEOCRADLE partners (including Project Coordinator).

WELCOME SPEECHES

Speakers: **Mr Luca Demicheli** – EGS Secretary General

Mr Ahmed Benlakhdim – Director of the Geological Survey of Morocco



Mr Luca Demicheli, Secretary General of EGS, opened the meeting. He emphasized that the purpose of this meeting is not just to have an information session, but to have feedback from the audience and a live exchange of views and opinions, as a starting point for future work together. Mr Demicheli thanked Mr Benlakhdim for kindly hosting the meeting and offering warm hospitality. He mentioned that Mr Benlakhdim participated in the last EGS Directors' Workshop in Brussels, and he expressed his will to continue with this collaboration. Mr Demicheli noted that the geological potential of Morocco is enormous and it is important that Morocco invests in geology, as it is also important for the EU to have such a partner. He wished a fruitful meeting and a productive day to all the participants.



GEO-CRADLE: Coordinating and integrating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East, and Balkans and Developing Links with GEO related initiatives towards GEOSS

Mr Ahmed Benlakhdim, Director of the Geological Survey of Morocco, pointed out that raw materials are very important for Morocco. Geology is an essential part of mineral extraction and exploitation and the economic development of the country. Currently the Ministry is working on a new mineral legislation, which will reflect the real needs of the mining sector. This reform of legislation is welcomed by all stakeholders.

INTRODUCTION

International Cooperation on Raw Materials

On behalf of **Mr Mattia Pellegrini**, Head of the Unit Resource Efficiency & Raw Materials, DG GROW of the European Commission, Mr Luca Demicheli, EGS Secretary General, presented the EU Raw Materials Framework with its three building blocks: 1) Raw Materials Initiative (Policy and Strategy); 2) European Innovation Partnership on Raw Materials (Strategic Implementation Plan); and 3) Horizon 2020 (Funding Tool). The Raw Materials Initiative is an integrated strategy to respond to the different challenges related to the access to non-energy and non-agricultural raw materials. It ensures level playing field in access to resource in third countries, it fosters sustainable supply from European sources, and it boosts resource efficiency and recycling. The action is focused not only on the deposit identification, but also protection of the environment; there is strong focus on the non-energy mineral resources and critical raw materials, especially for the ones that have to be imported to Europe. The European Innovation Partnership on Raw Materials ensures the sustainable supply of raw materials to the European economy, targeting up to 10 innovative pilot actions, substitutes for at least 3 applications of CRMs, regulatory framework for primary and secondary RM, EU RM knowledge base, as well as international cooperation strategy. The Horizon 2020 secures the EU's supply of primary and secondary raw materials through Research and Innovation, being open to the world (applicants from non-EU countries are also eligible) with mutual benefits: access to knowledge, open up markets, sharing expertise, improve research quality, science diplomacy, higher global profile. One of the three pillars of H2020 is the Societal Challenges (€ 31 billion), including "Climate action, environment, resource efficiency and raw materials" (No. 5). The Partnership Instrument (PI) was analyzed, including opportunities for participation, general principles, main features, specific objectives, eligible types of actions/projects as well as examples of types of projects funded by PI. A special focus was put on the PI opportunities for the mining sector, through TAIEX, PSF or Stand Alone. The presentation was concluded with the invitation to the Raw Materials Week in Brussels, held between 30/11/2016-02/12/2016.

SETTING THE SCENE (9:00-10:30)

Co-Chairs Dr Gerardo Herrera, Chair of the EGS Earth Observation and GeoHazards Expert Group, and **Prof Marek Graniczny**, Chair of the EGS International Cooperation and Development Task Force

GEO-CRADLE Overview: Project objectives and overall approach

Speaker: **Dr Haris Kontoes** – Project Coordinator (NOA, Research Director)



Dr Kontoes highlighted that GEO-CRADLE is a project that aims at fostering regional cooperation and a roadmap for GEO and Copernicus implementation in North Africa, Middle East and the Balkans, and emphasized the GEO-CRADLE benefits for stakeholders and end-users. The GEO-CRADLE mission is to set up a network for a wide range of EO data applications, based on the needs of society, public, research and commercial market. Dr Kontoes presented the objectives of the GEO-CRADLE with its four pillars: 1) Exploit synergies and cross fertilization; 2) Apply an impact driven methodology; 3) Implement a top-down and a bottom-up approach for GEO & Copernicus in the ROI; and 4) Achieve a lasting and sustainable effect in the ROI. He continued with the analysis of the project's overall approach, which includes the Inventory of capacities and user needs in the ROI, the Gap Analysis, the Maturity Indicators and Priorities, the Pilots towards regional challenges, the Regional Contribution to GEOSS & Copernicus, and in parallel the Dissemination & Engagement and the Impact Analysis in the end. Dr Kontoes analyzed the ongoing WPs and concluded with a set of recommendations to the GEO-CRADLE partners and involved stakeholders. He encouraged them to disseminate the scope and perspectives of GEO-CRADLE towards enlarging the EO market at regional level and the country; to be engaged and assist reporting on the needed support in relation to EO data, excellence, education, funding schemes; to provide analytic information about the priorities set out by the local decision makers in each one of the four thematic priorities of the call; to use the project as the driver to outreach the country's state-of-the-art to the wider markets, and assist the setting up of beneficial joint ventures and partnerships; and to support the development and enrichment of the Regional Data Hub (RDH) with data, facilitating the local EO community to build upon it of new businesses of wider interest in the ROI.



The role of Geological Surveys in the GEO-CRADLE project and scope of the workshop

Speaker: **Mr Luca Demicheli** – EGS Secretary General



Mr Demicheli started his presentation explaining the scope of the workshop and the role of the Geological Surveys in the GEO-CRADLE project, with a focus on the relevant pilot on raw materials. He also introduced EGS, which brings together 37 Geological Surveys, with the vision to establish and provide a European Geological Service based on a cross-challenge research programme on applied geoscience, including research, infrastructure, and exchange. He referred to the GeoERA which is just starting and includes a theme on raw materials. He presented a series of unique pan-European datasets (mineral resources, mineral deposits, soils geochemistry) as well as the EGS European Geological Data Infrastructure (EGDI), providing access to pan-European and national geological datasets and services, and supporting the implementation of EU Directives, such as INSPIRE. Mr Demicheli noted that building EGDI database established a “home” for pan-European geological datasets and services from past and upcoming projects. Moreover, he underlined the importance of the sharing of knowledge, capacities and infrastructures, e.g. through laboratories, GEO, geological continental cooperation, and external relations (such as with ASGMI, OAGS, PanAfGeo). Apart from PanAfGeo, Mr Demicheli highlighted another concrete opportunity: the European Innovation Partnership on Raw Materials (EIP), advancing the idea of a World Forum on Raw Materials and the International Network of Raw Materials Training Centers (SC5-16 c).

Replying to a question from the audience, Mr Demicheli clarified that EGS works in the interest of the governments and the citizens, but its mandate also includes supporting industrial growth and working with the private sector, but not for the private sector. Therefore EGS consults the industry and provides data to the private sector.



The role of CRTS in promoting the Earth Observation technology

Speaker: **Ms Amal Layachi** – Head of Training Department of CRTS



Ms Layachi introduced CRTS and presented its objectives / missions, the overall characteristics of the evolution of national capacities on earth observation, and finally the contribution of CRTS in the capacity building at national and regional level. Several projects were presented linked to various thematic areas e.g. water extremes, forests, urban planning and management, water management, environmental impact, geohazards. Moreover, CRTS is developing tools to address user needs, provide access to EO data and performs an ongoing training program for the R&D sector. Finally, CRTS has developed international cooperation in partnership with other African countries, UNESCO, FSR etc.

Replying to questions from the audience, Ms Layachi said that CRTS sells its products and services at low price to reserve its operations and impartiality. As for the CRTS trainings there is no cost in principle, but the processes are adjusted to the user capabilities. Especially for the research sector there are programs in cooperation with universities that allow students and PhD candidates to participate at a very low cost. Dr Kontoes pointed out that it would be beneficiary for GEO-CRADLE to add information about the CRTS data portal in the GEO-CRADLE Data Hub. Ms Layachi answered that the CRTS portal is not free of charge and the access to the data depends on the data type; nevertheless CRTS is open for collaboration. Regarding using EO data for the mining sector, Ms Layachi said that the users can download the data from CRTS and add value for their specific application. She also said that CRTS is familiar with the ongoing European project of Corine land cover monitoring, and they base on it to develop a similar national project for Morocco.



EUROPE – AFRICA GEOLOGICAL COOPERATION AND THE IMPORTANCE OF GEOSS (11:10-12:40)

Co-Chairs Ms Eleftheria Poyiadji and Ms Maria Przylucka, Deputy Chairs of the EGS Earth Observation and GeoHazards Expert Group

The role of Geological Surveys into GEOSS and Copernicus

Speaker: Dr Gerardo Herrera, Chair of the EGS Earth Observation and GeoHazards Expert Group



Dr Herrera started his presentation introducing the EGS Earth Observation and GeoHazards Expert Group, which seeks to apply Earth Observation technology to improve delivery of geoscience information on geohazards and raw materials. EGS applies and develops EO-based methods and tools to improve the interaction between the mineral extractive industry and society for its sustainable development while improving its societal acceptability. Dr Herrera emphasized the important role that the Geological Surveys play into GEOSS and Copernicus. He focused on the new Copernicus possibilities provided by the Sentinel satellite constellation, from which Sentinel-1 (SAR) and Sentinel-2 (optical) data are already available. He presented various examples of the use of EO data for geological mapping, mineral mapping, and mining monitoring: the Angola geology map, a mineral thematic map from the Czech Republic showing surface geological materials from hyperspectral data, a mining waste map from Portugal derived from hyperspectral data and field measurements, a soil pH map derived from mineral association using hyperspectral imagery, a map of surface water parameters from hyperspectral and HR optical satellite (Worldview 2), a Sentinel-2 data preliminary evaluation for mineral mapping, and a simulation of EnMap data to test mineral mapping potential of the future hyperspectral satellite. Dr



Herrera highlighted the potential research and development needs for mineral mapping and mining monitoring. Mineral mapping needs developing models for quantitative assessment of physical and chemical surface properties (mines, post-mining areas, remediation) using Sentinel-2 and EnMap satellite data; as well as building world-wide mineral/rock/soil reflectance and emissivity libraries. For mining monitoring Dr Herrera referred to the detection of underground coal mining subsidence in urban areas using Radar Interferometry (InSAR), the detection and monitoring of ground instabilities related to mining tailing dumps based on satellite radar interferometry, and the monitoring of mining activity with Sentinel 1 service level targeting active mines, abandoned mines, mining waste and induced anthropogenic hazards. Finally he underlined the contribution of EGS to the building of a community of remote sensing users and service developers in the industry of raw materials and extractive industries, through GEO-CRADLE, PanAfGeo, LATAM and New Geo – Community of Activity.

Replying to questions from the audience, Dr Herrera said that the hyperspectral mineral mapping is used for various products, among others local distribution of the minerals. As for hyperspectral data from satellite missions, he replied that the EnMap mission will be launched in 2019. Regarding the ownership of the data, he explained that it depends on the satellite; for example the Angola geology map is open to the public. Concerning the capacity building, he replied that the idea is to promote trainings and knowledge sharing by extending the international cooperation with projects like PanAfGeo and AFRIGEO. To the question if the Expert Group has mapped and prioritized needs, he answered yes, in the framework of the GEO-CRADLE project; and when he was asked if EGS can carry out projects and give products to Morocco he said yes, they can be shared. Finally, he was asked if the Geological Survey of Morocco can join EGS, and he explained that EGS includes members from Geological Surveys of Europe; however the Geological Survey of Morocco is welcome to cooperate and even develop research projects together, e.g. under H2020 which is open to Morocco as well with funding for travelling and capacity building.

The cooperation with the Organisation of African Geological Surveys and the role of Earth Observation (including good examples of regional cooperation, needs of stakeholders and end-users)

Speaker: Prof Marek Graniczny, Chair of the EGS International Cooperation and Development Task Force

Prof. Graniczny presented a successful example of European-African cooperation during the feasibility study for training and capacity building in African Geological Surveys. The cooperation involves two international organizations – EuroGeoSurveys, the Geological Surveys of Europe (EGS) and Organization of African Geological Surveys (OAGS). The steps leading to the creation of the project concluded with the preparation of the pilot Pan-African project, run by the EGS International Cooperation and Development Task Force, which aimed at performing a feasibility study “Geoscientific knowledge and skills in African Geological Surveys”. The main objectives of the feasibility study were to enhance the capacity and role of African national geological surveys; contribute to capacity building in assessing mineral resources; and strengthen the level of national geological surveys through trainings. The final report was submitted to DG DEVCO in March 2015. Prof. Graniczny highlighted the necessity in using EO data in Africa, specifically in geological mapping, exploration of raw materials and groundwater, identification and monitoring of geohazards and assessing the impact of mining activity on the surrounding environment.



GEO-CRADLE: Coordinating and integrating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East, and Balkans and Developing Links with GEO related initiatives towards GEOSS

Replying to questions from the audience, Prof. Graniczny said that the questionnaire used for PanAfGeo was sent first to the Geological Surveys directors, but the response was very low, so EGS own contacts were used, and doors are open to everyone interested. As for the strategy for capacity building implementation, he explained that the countries were selected taking into consideration security and language issues. Seven different thematic trainings by European and African experts will be provided and IT equipment will be given as well. Mainly the Geological Surveys will benefit, but the Universities will be involved too.



TECHNICAL SESSION (14:00-16:00)

Co-Chairs Ms Veronika Kopackova, EGS Earth Observation and GeoHazards Expert Group and Ms Maria Przylucka, Deputy Chair of the EGS Earth Observation and GeoHazards Expert Group

GEO-CRADLE WP 2 – Results from inventorying the regional capacities (T2.1-T2.3) in the field of Raw Materials

Speaker: Ms Eleftheria Poyiadji – IGME-Greece, T2.2 Leader

Ms Poyiadji started her presentation explaining the importance of the inventorying of the regional capacities and user needs in order to provide a complete and accurate picture of the current status of EO capacities and skills in the RoI (with regards to space-borne infrastructure, in-situ networks and modelling and computing facilities), and conduct a thorough user need analysis. She then presented the online survey which was used and the results so far, both overall and per country. In total there were 46 entries in the thematic area of access to raw materials. Ms Poyiadji emphasized that workshops like the one in Morocco are extremely beneficial. The example of Novi Sad workshop was given, which resulted



GEO-CRADLE: Coordinating and integrating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East, and Balkans and Developing Links with GEO related initiatives towards GEOSS

to a boost of stakeholders' participation in the on-line survey (after Novi Sad a rise of 37% was recorded). Finally, Ms Poyiadji referred to selected examples of counties with focus on countries from North Africa, and urged the audience to fill in the survey and also spread it to the relevant stakeholders.



GEO-CRADLE WP 2 – Results from the user need analysis (T2.4) with focus on North Africa

Speaker: **Ms Alexandra Jercaianu** – EURISY, T2.4 Leader

Ms Jercaianu presented first the process outcomes and main findings of the end-users needs analysis. It is possible to identify homologue user organisations and networks across countries: equivalent public authorities structure; submitted to similar regulations (especially EU, international) which often link public and private sector, and despite being different, working on the same theme (e.g. water is a big transversal topic to energy, raw materials, climate change, food security). As for the information needs, they are similar across these networks / thematics; while for geo-information services to be relevant to end users, they need to include non geo-data (e.g. demographics, information on land available for sale etc). End-users need the information to be accessible, shared and shareable, precise, open and free. End-users need more knowledge on how to use the product (use of new technology), which is seldom the case. Ms Jercaianu then focused on North Africa, and specifically on Morocco, Tunisia and Egypt. She referred to the information needs, the data sources, and the constraints, and concluded on how the region may benefit from a free and open regional data hub: Morocco and Tunisia, CRTS (Royal Remote Sensing Centre of Morocco) and CNCT (National Mapping and Remote Sensing Centre of Tunisia) respectively, being key entry points for end users and federate needs, giving access to relevant additional data, serving as platform for users with common stakes (e.g. water managers), and providing new opportunities for the private sector.



GEO-CRADLE WP 3 – Results from the gap analysis and the assessment of maturity indicators in relation to GEO, GEOSS, and Copernicus in the field of Raw Materials

Speaker: Dr Haris Kontoes – Project Coordinator (NOA, Research Director)

Dr Kontoes started reminding the GEO-CRADLE implementation in steps, where the gap analysis is preceded by the inventory of capacities and followed by the pilots towards regional challenges. He presented the results from the gap analysis, where 260 responses were collected in total, mostly in Food Security & Climate Change, and less in Access to Raw Materials & Energy. The methodological aspects for GAP Analysis are: EO capacities (identified through inventorying of key EO actors); EO end-user needs (identified through in-depth end-user interviews of a representative sample); and Maturity indicators (characterize identified gaps and pinpoint where in the value chain they occur). Dr Kontoes emphasized the need for high quality end-user interviews and for country partners to drive intensive inventorying. 41 maturity indicators were used across the value chain: geographical, observational, structural, qualitative/quantitative, capacity for use. The maturity indicators capture the level and measure the progress of each country in the implementation of GEO and Copernicus. The assessment on the maturity level per country is based upon the outcomes from the survey and the gap analysis. The methodology uses the following stages: desk research, semi-structured interviews with country partners, validation of findings by experts, comparative assessment per country level. The indicators are grouped by capacities, cooperation and uptake. For each indicator a table is created providing description, parameters, constraints, gap analysis, comments. Five maturity levels are defined: initial, basic, intermediate, advanced, and optimized.



Dr Kontoes summarized the results per group of countries. Romania, Bulgaria & Cyprus (EU members) have ground receiving stations that are integrated into European level space programs. Western Balkans (not EU members) are small countries with no space program and no space strategy. Greece, Turkey & Israel are more advanced: Turkey has its own satellite program, Greece is part of ESA and integrated with European level space missions, Israel has large degree of maturity. Egypt has its own space program and space strategy. Tunisia, Morocco and Algeria have space strategies, agencies and operational programs defined years ago, as well as participation in EO efforts. The main identified gaps are: significant EO domination by the public sector, reluctance to share data between organizations, lack of educational capacities (Western Balkans), large difference between countries and within countries, and vulnerability to politics – lack of institutionalization. Dr Kontoes concluded with the message that WP3 is in the very beginning phase of the project and the action is still ongoing. Therefore, if a country is still not well represented in the results of the survey and the gap analysis, more institutions are always welcome to join the online questionnaire and provide valuable information about the EO capacities in the country.

Examples of regional cooperation: Consulting stakeholders: WHY?

Example projects from the Balkan Region

Speaker: **Kiki Hatzilazaridou** – IGME-Greece

Ms Hatzilazaridou presented the SNAP-SEE (Sustainable Aggregates Planning in South East Europe) project, whose goal was to improve national and regional aggregates' planning in SEE countries by developing a Toolbox. The project focused on enhanced cooperation, information sharing and capacity building amongst relevant stakeholders. In some participating countries, the consultation process was the first step in starting a debate with regards to sustainable aggregates planning. Major issues were raised as common in many countries such as: illegal quarrying, promotion of the use of recycled



GEO-CRADLE: Coordinating and integrating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East, and Balkans and Developing Links with GEO related initiatives towards GEOSS

aggregates, need for improvement of mining legislation, protection of mineral deposits against other land uses, poor coordination and/or lack of cooperation between authorities. In many cases suggestions for solutions were offered. Over the last years, the importance of mapping stakeholders' interests and needs with regards to mineral raw materials has significantly increased and acknowledged by the authorities at national and EU level. Ms Hatzilazaridou concluded that the SNAP-SEE experience has proven that involvement of different stakeholders is beneficial and results in enhanced cooperation, long-term benefits and better-informed decisions.



The example of the EO-MINERS project

Speaker: **Veronika Kopackova** – CGS

Ms Kopackova presented the EO-MINERS Research and Technological Development project, whose goal was to help EC improve its raw material policy and better exploit mineral resources from the European territory, to demonstrate how to improve the capacity of Europe in implementing new mining sites, and to improve interaction between the mining industry and society. The consortium included 14 partners from 8 countries and 3 demonstration sites located in Czech Republic, Kazakhstan and South Africa. The scope of the project started with founding indicators and appropriate EO methods and tools, which were then used for producing EO-based monitoring products. Ms Kopackova presented examples of the products which were produced in the test sites, like: apparent thermal inertia, pH, change of the mining footprint through time, mining-related fires, soil and surface water contamination, mineral mapping used for water quality assessment. Project results were provided in a number of forms, each designed to explain results to a range of stakeholders: reports, digital layers, paper maps, digital maps, animated over-flies, each with associated information and validation histories. The stakeholders' dialogue included both European and site-specific activities.



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The example of the PanAfGEO project

Speaker: **Prof Marek Graniczny** – PGI





GEO-CRADLE: Coordinating and integrating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East, and Balkans and Developing Links with GEO related initiatives towards GEOSS

Prof. Marek Graniczny presented PanAfGeo project as another example of international cooperation focused on stakeholders' needs (the genesis of the project was already presented in a previous presentation). The first phase of the initiative finished with the feasibility study of the geoscientific knowledge and skills in the African Geological Surveys. The second phase is the dedicated trainings which aim to improve the expertise of the African Geological Surveys. The trainings will cover several topics: geoscientific mapping, mineral resources, environmental management, geohazards, geoheritage and IT. Prof. Marek Graniczny described the scope of the project and the involvement of certain Geological Surveys in each of the thematic areas. He explained the preliminary plan of the trainings and for each of the thematic areas he presented the draft scope and the main goals of the training, together with the location in the respective countries. The project will work with targeted thematic trainings, and all African countries will be targeting some equilibrium between regions and languages. The project will be linked to key networks and partners who can both contribute to and participate in aspects of training (such as UNESCO, GSAf, WB, EDF, GIRAF, etc), and it will leverage existing knowledge and add to existing initiatives.

DISCUSSION ON T4.3 “ACCESS TO RAW MATERIALS” AND CONCLUSIONS (16:30-17:30)

Chair Mr Luca Demicheli, EGS Secretary General

Proposal of pilot studies for T4.3 “Access to Raw Materials”

Speakers: **Prof Marek Graniczny**, EGS/PGI, leader of T4.3, **Ms Maria Przyłucka**, EGS/PGI

Prof Marek Graniczny reminded the scope of the Access to Raw Materials (ARM) pilot, which aims at performing a feasibility study on a roadmap for better long-term monitoring, mapping and management of mineral deposits in a severely under-explored RoI, using elaborated EO methodologies to reduce the impact on the surrounding areas. Ms Maria Przyłucka presented different EO techniques, used for mining and post-mining areas: satellite SAR interferometry, optical imagery, hyperspectral imagery, airborne and UAV LIDAR, terrestrial LIDAR and in-situ field measurement. Prof Graniczny explained that the selection of the regional mining study areas is based on the local characteristic and mining exploitation history and activity (e.g. 3 locations), and the aim of this selection is to establish a roadmap for long-term monitoring, mapping, and management of mineral deposits in a severely under-explored ROI. The proposed 1st pilot is Monitoring of Illegal Quarrying in Greece. In spite of an existing legislative framework for Quarrying, some SEE countries are facing problems with illegal quarrying activities. This issue is related to severe economic, social and environmental impacts affecting not only the restricted area where such activities take place, but also wider areas. Efficient and consistent monitoring processes and tools will allow better management of quarrying and will mitigate illegal quarrying activities. The proposed 2nd pilot is Environmental Monitoring of Ayios Filippou Abandoned Public Mine of Mixed Sulphide Ores - Kirki Village (North Greece). These are the two principal sites, where most of the potentially polluting hotspots, e.g. excavation works, waste rock piles and flotation tailings ponds, are located. The aim is to create a database and develop a methodology to be used to assess the environmental impact at local and regional scale and to serve as a baseline for assessment of post mining restoration. Deliverables are to be used by the end-users for the improvement in the environmental rehabilitation works. Another proposed pilot site is a mining / post mining area in Romania where the



field campaign has covered six sites which were visited for sample collection and ground observations. Moreover three mines are proposed on the Troodos Ophiolite in Cyprus. Prof Graniczny concluded that the opportunity to obtain and use space-born data will contribute to the development of the necessary skills in order to plan and execute more comprehensive and effective solutions / measures for: a) long-term monitoring of ground deformation / stability waste dumps, b) map waste dumps and abandoned mines as potential exploitation for both primary and secondary mineral resources with parallel environmental restoration, c) develop better practices for the rehabilitation of abandoned mines. He added that the idea is to set up a methodology that can be implemented in the future.

Panel discussion and interaction with the audience

Speakers: **GEO-CRADLE, Geological Survey of Morocco, EGS**



After the proposals of pilot studies by Prof Graniczny, a panel discussion took place with the audience. All stakeholders, especially from Morocco, were encouraged to propose a mining or post-mining area that can be subject to a feasibility study in terms of using EO data. Indicatively such pilots could be related to:



GEO-CRADLE: Coordinating and integrating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East, and Balkans and Developing Links with GEO related initiatives towards GEOSS

- long term monitoring of ground deformation during or after mining activities,
- mapping of waste materials left over in abandoned mines,
- development of an appropriate protocol for the evaluation of the environmental impact, together with feasibility assessment of extractive or mining waste potential to become exploitable secondary resources.

Dr Kontoes and Mr Demicheli proceeded with the final conclusions. They emphasized the importance of the meeting, which was very useful for both sides. On the one hand, the GEO-CRADLE team learned a lot about Morocco and its capacities. On the other hand, it was beneficiary for the raw materials community of Morocco to learn about the project and be invited to contribute. The meeting offered the opportunity to local and regional in-situ network operators and Geological Surveys representatives to come together. In this direction several stakeholders were identified in the domain of access to raw materials, and the usefulness of EO data for raw materials was shown on various examples. But the key point to make it work is to establish a network between service providers, end-users and other relevant stakeholders; which is one of the aims of GEO-CRADLE. Dr Kontoes invited the audience to the workshop of the following day, where there will be a chance to express in detail the needs and discuss about the possible opportunities, benefits and solutions. Mr Demicheli thanked the participants for the collaboration hoping to continue in the future. Dr Kontoes also thanked the audience, and the hosts for their kind hospitality.



Stakeholders' workshop "Using geo-information services in the Middle East and North Africa", 18 October 2016, Rabat, Morocco

Introductory notes: GEO-CRADLE: Integrating regional capacity & building ecosystems (9:30-9:50)

Speaker: **Dr Haris Kontoes** – Project Coordinator (NOA, Research Director)

Dr Kontoes briefly introduced the current phase of the project and explained the importance of the GEO-CRADLE survey in order to collect adequate and reliable responses with a good thematic and geographic coverage. He then presented the responses from Morocco so far, and encouraged the relevant stakeholders in the audience to take part in the survey and disseminate it. Dr Kontoes explained that the answers help GEO-CRADLE to build a comprehensive picture of the Earth Observation capacities in the Balkans, North Africa and Middle East. Based on the survey results GEO-CRADLE supports the establishment of integrated EO services that meet regional priorities, and contributes to the implementation of GEOSS and Copernicus in the region.

Dr Kontoes emphasized that the participants join a large, regional network of stakeholders; gain access to important information and promote their capacities through the GEO-CRADLE portal and the Regional Data Hub; participate in concrete community activities (e.g. setting regional priorities, contributing to working groups) that pave the way towards a future regional GEO and/or Copernicus initiative; keep up-to-date with current collaboration and business opportunities in the region, networking events and EO-related news.





Best practices, collection of stakeholders' needs, and enrichment of the GEO-CRADLE network of stakeholders with new members, Q&A (9:50-12:00)

Following the introductory notes by Dr Kontoes, the GEO-CRADLE survey was presented and each section was explained:

- General Info: contact details;
- Activity Focus: your Organisation's role in the value chain, main thematic areas of activity, participation in EO-related projects, participation in Copernicus, participation in GEO/GEOSS SBA Tasks, collaboration with other EO actors;
- Capacities: space-borne capacities, ground-based/in-situ monitoring networks/facilities, modelling and computing processing capacities, EO data exploitation;
- National Activities: national funding for EO activities, national space policy/strategy, existence of national space agency, coordination of EO activities in the country, interaction between the EO community and decision makers in the country, organisation of EO dedicated workshops in the country;
- Engagement in GEO-CRADLE: contribution with your capacities to a regional initiative of GEO and/or Copernicus, provision of feedback for establishing a roadmap for the implementation of GEO and Copernicus in the region, participation in future GEO-CRADLE networking events and portal.

Hard-copies of the survey were distributed to the participants and time was given to them to fill it in. During this process new contacts were established and an interesting open discussion took place identifying end-user needs, challenges and best practices in the region.

The GEO-CRADLE Project Coordinator responded to a series of questions regarding the opportunities which the European Union provides in terms of networking, capacity building, technology transfer and funding. Other issues were discussed as well: regional needs and how geo-information data services respond to those needs; challenges to implement the services; cooperation between the user and the service provider; problem, solution, result for confirmed users of Geo-Information.



Special session in the 5th National Stratigraphy Workshop, 19-23 October 2016, Timimoun, Algeria

The event in Algeria was attended by over 200 participants representing the whole Algerian geoscientific community, mainly from universities and governmental institutions at the highest levels. In Algeria several sectors are not fully open to the free market, and the state-enterprises manage most of the country's resources, including raw materials. The heads and managers of all the main Algerian state-enterprises attended the meeting in Timimoun. Also Tunisia was represented at Director General level.

The GEO-CRADLE partners presented several aspects of the project via a series of presentations in a special session in the plenary during the first day of the 5th National Stratigraphy Workshop, raising a big deal of attention. The EGS Secretary General made an introduction to the broad scope of the project, explaining the role of the Geological Surveys and of the raw materials topics in the framework of GEOSS and COPERNICUS. The PGI representative, also Chair of the International Cooperation and Development Task Force, Prof Marek Graniczny, described the specific role of EGS and of raw materials in GEO-CRADLE. The Deputy Chair of the EGS Earth Observation and GeoHazards Expert Group, Ms Veronika Kopackova, entered into the technical details of the benefit of applying novel EO technologies to the raw materials sector. The reaction was overwhelmingly positive and, besides the many questions posed by the audience, several cooperation proposals were discussed.

During the days of the congress various bilateral meetings were held, and requests by several institutions to start capacity building projects were collected. A major issue seems to be the availability of funds to start and implement such actions. However, it appears that there is a genuine interest in collaborating with GEO-CRADLE and EGS by the Algerian institutions, which is worthwhile to further explore with the target to achieve practical objectives and measurable results.





The role of Geological Surveys in the GEO-CRADLE project and scope of the workshop

Speaker: **Mr Luca Demicheli** – EGS Secretary General

Mr Demicheli started his presentation explaining the scope of the workshop and the role of the Geological Surveys in the GEO-CRADLE project, with a focus on the relevant pilot on raw materials. He also introduced EGS, which brings together 37 Geological Surveys, with the vision to establish and provide a European Geological Service based on a cross-challenge research programme on applied geoscience, including research, infrastructure, and exchange. He referred to the GeoERA which is just starting and includes a theme on raw materials. He presented a series of unique pan-European datasets (mineral resources, mineral deposits, soils geochemistry) as well as the EGS European Geological Data Infrastructure (EGDI), providing access to pan-European and national geological datasets and services, and supporting the implementation of EU Directives, such as INSPIRE. Mr Demicheli noted that building EGDI database established a “home” for pan-European geological datasets and services from past and upcoming projects. Moreover, he underlined the importance of the sharing of knowledge, capacities and infrastructures, e.g. through laboratories, GEO, geological continental cooperation, and external relations (such as with ASGMI, OAGS, PanAfGeo). Apart from PanAfGeo, Mr Demicheli highlighted another concrete opportunity: the European Innovation Partnership on Raw Materials (EIP), advancing the idea of a World Forum on Raw Materials and the International Network of Raw Materials Training Centers (SC5-16 c).

The cooperation with the Organisation of African Geological Surveys and the role of Earth Observation (including good examples of regional cooperation, needs of stakeholders and end-users)

Speaker: **Prof Marek Graniczny**, Chair of the EGS International Cooperation and Development Task Force

Prof. Graniczny presented a successful example of European-African cooperation during the feasibility study for training and capacity building in African Geological Surveys. The cooperation involves two international organizations – EuroGeoSurveys, the Geological Surveys of Europe (EGS) and Organization of African Geological Surveys (OAGS). The steps leading to the creation of the project concluded with the preparation of the pilot Pan-African project, run by the EGS International Cooperation and Development Task Force, which aimed at performing a feasibility study “Geoscientific knowledge and skills in African Geological Surveys”. The main objectives of the feasibility study were to enhance the capacity and role of African national geological surveys; contribute to capacity building in assessing mineral resources; and strengthen the level of national geological surveys through trainings. The final report was submitted to DG DEVCO in March 2015. Prof. Graniczny highlighted the necessity in using EO data in Africa, specifically in geological mapping, exploration of raw materials and groundwater, identification and monitoring of geohazards and assessing the impact of mining activity on the surrounding environment.

Earth Observation for raw materials

Speaker: **Ms Veronika Kopackova**, Deputy Chair of the EGS Earth Observation and GeoHazards Expert Group



GEO-CRADLE: Coordinating and integrating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East, and Balkans and Developing Links with GEO related initiatives towards GEOSS

Ms Kopackova started her presentation introducing the EGS Earth Observation and GeoHazards Expert Group, which seeks to apply Earth Observation technology to improve delivery of geoscience information on geohazards and raw materials. EGS applies and develops EO-based methods and tools to improve the interaction between the mineral extractive industry and society for its sustainable development while improving its societal acceptability. Ms Kopackova emphasized the important role that the Geological Surveys play into GEOSS and Copernicus. She focused on the new Copernicus possibilities provided by the Sentinel satellite constellation, from which Sentinel-1 (SAR) and Sentinel-2 (optical) data are already available. She presented various examples of the use of EO data for geological mapping, mineral mapping, and mining monitoring: the Angola geology map, a mineral thematic map from the Czech Republic showing surface geological materials from hyperspectral data, a mining waste map from Portugal derived from hyperspectral data and field measurements, a soil pH map derived from mineral association using hyperspectral imagery, a Sentinel-2 data preliminary evaluation for mineral mapping, and a simulation of EnMap data to test mineral mapping potential of the future hyperspectral satellite. Ms Kopackova highlighted the potential research and development needs for mineral mapping and mining monitoring. Mineral mapping needs developing models for quantitative assessment of physical and chemical surface properties (mines, post-mining areas, remediation) using Sentinel-2 and EnMap satellite data; as well as building world-wide mineral/rock/soil reflectance and emissivity libraries. For mining monitoring Ms Kopackova referred to the detection of underground coal mining subsidence in urban areas using Radar Interferometry (InSAR), the detection and monitoring of ground instabilities related to mining tailing dumps based on satellite radar interferometry, and the monitoring of mining activity with Sentinel 1 service level targeting active mines, abandoned mines, mining waste and induced anthropogenic hazards. Finally she underlined the contribution of EGS to the building of a community of remote sensing users and service developers in the industry of raw materials and extractive industries, through GEO-CRADLE, PanAfGeo, LATAM and New Geo – Community of Activity.



GEO-CRADLE: Coordinating and integrating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East, and Balkans and Developing Links with GEO related initiatives towards GEOSS

CONCLUSIONS

The events in Morocco and Algeria (both GEO members) further increased the stakeholders' engagement in the region, bringing together high-level Ministerial officers, Geological Surveys representatives, coordinators of regional initiatives and networks, relevant professors, scientists and researchers, local and regional in-situ network operators and EO-related companies.

With a series of interesting presentations, interventions and discussions, the events provided project partners and stakeholders with valuable knowledge on the identified regional EO capacities and skills, as well as the challenges in the domain of access to raw materials. They also provided opportunities to exchange information, register the needs, and share best practices in using EO services to facilitate access to raw materials, thus helping to identify a roadmap with solutions to enhance innovation in the geo-information sector.

Furthermore, the events in Morocco and Algeria contributed to the refinement of the scope of the relevant GEO-CRADLE pilot activity that will focus on the access to raw materials in the regions of Balkans, Middle East and North Africa, to the extent that this can be supported by GEO, GEOSS, and Copernicus. The meetings were in line with the objectives of PanAfGeo, Copernicus (GMES and Africa), and the new GEO Energy and Minerals Societal Benefit Area.

