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Report on networking and clustering actions, rules and recommendations for future EGDI operation

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Executive Summary

Driven by today's societal challenges, such as climate change, energy transition and the sustainable supply of raw materials, EuroGeoSurveys (EGS) and Europe's national and regional geological surveys are on the way to strengthening their contribution to and impact on European society by creating a Geological Service for Europe (GSE). To successfully achieve this vision, it is essential to build on cooperation within the established network and develop the processes and tools to support and strengthen the transition from what the EGS community can currently deliver to the more targeted services the GSE will provide. Without a strong i bond between its partners, a GSE cannot fully realise its added value. As part of the Geological Service for Europe (GSEU) project's WP9 (Geological Surveys network and sustainable services for Europe), ways are to be found to strengthen this cooperation on a selective basis, depending on current geoscientific challenges. At the same time, tools and support will be provided to EGS and GSE partner to simplify access to data and information that are key to boost collaborations.

A proof-of-concept for an **Expertise Search Service** was developed, which significantly facilitates access to information that enable the creation of networks on a topic or task based on reliable information (competences of institutions and individuals and facilities). As this concept has proved its worth, two pilot projects are now being implemented, the Yellow Pages for Geothermal Energy (part of the GSEU GeoEnergy working group) and for EGS Geophysics EGS Expert Group. If the pilot studies prove to be successful it will be necessary to determine whether the service should be implemented as an official GSE service within the future GSE.

One of the most important pillar of a future GSE is the European Geological Data Infrastructure (EGDI). EGDI can maintain is relevance and assure impact only if the data and information that are in it are continuously updated. To ensure this (and to ensure the high quality of the data and information) the **EGDI editorial board and the network of national metadata coordinators** were created**.**

Furthermore, particular emphasis was placed on enhancing networking activities to support the NZIA and the CRMA. This included strengthening collaboration within the geophysical community and between Central-East European surveys on the implementation of the two acts.

Finally, framework conditions for cross-border cooperation, which should also form a core of the GSE, were analysed using a practical example: a **concerted field operation** in which five geological services participated to investigate the landslide in **Pissouri** (Cyprus), where lessons learned were derived for future projects.

Abbreviations	
CCS	Carbon Capture and Storage
CRMA	Critical Raw Material Act
EGDI	European Geological Data Infrastructure
EGS	EuroGeoSurveys
EOEG	Earth Observation and Geohazards Expert Group
EPOS ON	European Plate Observing System Optimization and Evolution
EU	European Union
GSEU	Geological Service for Europe
GSO	Geological Survey Organization
NZIA	Net Zero Industry Act
WP	Work Package

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1. Introduction

The work behind this deliverable was focused on conducting and analysing tools and ideas which support networking activities between the European Geological Survey Organisations (EGS members) as essential actions for the preparation of a future Geological Service for Europe (GSE).
Based on the available resources and the upcoming demands on the GSOs this deliverable report focused on the following strategic activities:

- A proof-of-concept for an Expertise Search Service as a tool to support internal cooperation among GSOs in support of a future GSE
- Management regulations that allow to raise the quality of internal co-operation among the GSO (EGDI editorial board and network of national metadata coordinators)
- Establishment of a Geophysics Expert Group
- Networking the geological services of central-east European states to implement the CRMA
- Evaluation of a joint field mission (Pissouri, Cyprus) to derive lessons learned for future operational missions and in frame of a possible future market space within the GSE.

A proof-of-concept for an Expertise Search Service was developed in order to demonstrate its feasibility. The idea of the Expertise Search Service is to foster cooperation activities beyond the boundaries of existing expert groups and geological surveys. Within this deliverable we only focus on the motivation for the Expertise Search Service as part of an internal cooperation strategy. The development and implementation plan for the Expertise Search Service is described in the GSEU Deliverable 9.3 (Geological Services Knowledge Hub Development & Implementation Plan).
Ensuring the availability of high-quality, reliable data and information on the subsurface is of fundamental importance for achieving the goals set within the CRMA and NZIA. The planned GSE will be able to provide such high-quality (and updated) data in combination with the very strong geoscientific expertise of the future GSE members. EGDI is the platform to provide this information. The governance of EGDI data management and updating is an activity that goes beyond the scope of each of the individual work packages of the GSEU project, and therefore one activity of Task WP.9.1 is to develop the foundations for sustainable data management of the EGDI portal. For this, the EGDI editorial board and the network of national metadata coordinators were established in close cooperation with WP7.

In addition, work was concentrated on thematic networking activities which arose due to the demands of the EU Commission and other stakeholders, and which will be relevant for a future GSE.
During the reporting period, we concentrated on networking activities in support of the Critical Raw Materials Act and the Net Zero Industrial Act. Geophysics plays a significant role in both acts, and due to this relevance, a close cooperation within the geophysical community of GSOs could have a relevant impact on the success of the future GSE. Within last years there have been hardly any special cooperation efforts on geophysics within EGS. To assess the significance of geophysical capabilities within GSOs, an initial survey was conducted to ascertain existing competencies. The survey results demonstrated a high level of expertise, prompting the establishment of an expert group for geophysics.

The implementation of the CRMA requires the creation of homogeneous, pan-European data sets on the European subsurface. During discussions between the directors of Central-Eastern European GSOs during a meeting of the directors in Brussels, it was revealed that the quality of such data varies significantly between countries. These findings led to the conclusion that there is a particular need for cooperative actions for Central-Eastern European countries in the implementation of the CRMA.

Consequently, regular networking and clustering meetings Central-Eastern European GSOs were initiated, where the possibilities of cross-border cooperation and transnational assistance related to the CRMA were discussed and evaluated.

In addition, a joint field mission in Cyprus was conducted at the request of a national stakeholder, providing a model for cross-border cooperation among GSos. The results of this mission offer valuable insights, indicating the feasibility and usefulness of implementing a market space within the Future GSE. The field mission in Pissouri is subject to continuous monitoring and evaluation to derive lessons learned for future cooperation activities.

2. A tool to Support Internal Cooperation: the Expertise Search Service

In the past, the main triggers for developing cooperation between the GSOs were applications for joint projects (from a limited number of GSOs), cooperation within the framework of thematically predefined expert groups and individual contacts that led to bilateral cooperation (cooperation mechanism of "direct reciprocity"). For the future Geological Service for Europe, the internal cooperation has to be strengthened.
Today's challenges, in particular climate change mitigation measures and resource availability in the context of climate change adaptation, make it necessary to provide pan-European information sources of high and homogeneous quality as a basis for fact-based decisions at national and EU level. E.g. the effective management of groundwater is contingent upon the availability of cross-border data, given the interconnected nature of groundwater and surface water systems that transcend national boundaries.

In order to provide this information base and the knowledge derived from it, the GSO network wants to develop the Geological Service for Europe (GSE). For this endeavour to be successful, it is essential to rethink the cooperation structure between the GSOs in order to make the full potential of the competences available in the GSOs accessible.
Addressing current challenges requires cooperation not only within Expert Groups but also between them. Additionally, collaboration is needed with other thematic areas that some Geological Survey Organizations (GSOs) cover, even if these areas are not yet formally integrated into existing cooperation structures.
In the context the GSE it is important to create innovative opportunities for the generation of ad-hoc collaborations to quickly tackle issues and propositions. The interaction of interdisciplinary expertise plays an important role here.

The thematic content of future cooperation requirements is difficult to predict in advance when very specific topics are involved. The basic areas of cooperation of the GSE are defined in the SRIA, but the detailed requirements of the European Commission and the member states often concern specific problems that a future GSE will be confronted with, and whose answers also require very selective knowledge. This highly specialised knowledge must be made available at short notice in order for the GSE to be impactful. Consequently, there is a necessity to establish a tool that facilitates the immediate access to very specialized expertise of GSOs, grounded in the reputation of individuals (mechanism of 'indirect reciprocity'; Schmid L., 2021), thereby ensuring a swift and effective response in the event of an incident.

To this end, GSEU's Task WP.9.1 has developed a proof-of-concept for an expertise search service. This service enables the rapid identification of relevant GSO expertise and fosters long-term interdisciplinary collaboration beyond existing networks, such as those formed through personal connections during expert group meetings.
In this respect it is important that the assessment of an institution's expertise is not (only) qualified based on individual, subjective information, that are given by the experts themselves, but is additionally generated through the automatic harvesting of freely available, independent and widely recognised

sources (like project or peer reviewed publication data bases). This should enable the expertise strengths of an organization to be identified as objectively as possible and enables the user to design the cooperation network that best suits her/his requirements. It thus serves as an access point for the user community to find information on the expertise of individual GSOs, projects and experts in a variety of geological areas. This will significantly strengthen the capabilities of the internal cooperation network of the future EGS.

Further details on the implementation plan for the expertise search service can be found in the deliverable D9.3 – Geological Services Knowledge Hub Development & Implementation Plan.

In 2025 and 2026, the prove-of-concept presented in this document will be perfectioned and analysed via the development of two pilots tasks, one for the yellow pages of another GSEU Work package and the other for the geophysical expert group.

3. EGDI Editorial Board and Network of National Metadata Coordinators

In order to establish a GSE that is both effective and impactful, it is essential that the network of GSOs is organised in such a manner that ensures the reliable and regular updating of EGDI data. This, in turn, will lead to the attainment of a consistent level of pan-European geoscientific data of homogenous quality. To ensure the long-term relevance, completeness, quality and usability of the EGDI data, three institutional networking initiatives have been implemented during the reporting period.

- Approval of the so-called Rovaniemi Accord: it states that when EGS members participate in geoscientific projects that produce pan-European or cross border data it shall be considered to use EGDI as the platform for the dissemination and long-term safeguarding of these data
- Organising and setup of a network of national metadata coordinators that are responsible for maintaining the metadata for the data sets from their own country, that are available through EGDI
- Establishment of the EGDI Editorial Board, which consists of members from the EGS Expert groups taking responsibility for the data content in EGDI

3.1. The Rovaniemi Accord

The European Geological Data Infrastructure (EGDI) has a crucial role in the EuroGeoSurveys (EGS) and GSE strategy. It is essential for a future sustainable Geological Service for Europe to ensure pan-European data provision, research and scientific advice.
High quality, harmonised, standardised, accessible, and as complete as possible geoscientific data of the European continent are a prerequisite to serve the different stakeholders of a Geological Service for Europe. EGS is in a very strong position to provide such services as EGS members have a long tradition of participating in EU funded research projects that generate large amounts of relevant geoscientific data, and also of establishment of databases and other infrastructures to store and disseminate these data.
It was formulated that through continuous development of the EGDI, EGS aims to achieve the following:

- The best possible foundation for a Geological Service for Europe by incorporating results from as many geoscientific projects as possible into the platform
- Sustainability of project results: To ensure that results of European projects involving EGS members remain available and are maintained
- FAIRness of the data: Ensuring that the data is highly FAIR (Findable, Accessible, Interoperable, and Reusable)
- Visibility of the EGS: Using EGDI to increase the visibility and recognition of the EGS and its members

However, the EU almost never funds the ongoing operation of such infrastructures so that access to the results is very often lost a few years after the end of the project. This was previously common, but in 2016 EGDI was established to avoid this. EGDI provides a sustainable infrastructure in which the results can be saved and from which they can be disseminated.
Thus, the situation is much better with EGDI. For example, all the data generated in the GeoERA projects is now securely stored in EGDI and can be accessed, not only from the GeoERA websites, but also from the EGDI website. Similarly, the GSEU project also utilises EGDI. However, there are, still

many examples of projects where large amounts of data have been and are being generated that are not stored in EGDI. In many cases this is because participants are unaware of EGDI and have chosen to store data and infrastructures elsewhere or create new infrastructures.
In mid-2023, the EGS Executive Committee asked the SIEG Chairs to propose certain rules regarding the use of EGDI in European geoscience projects in which EGS members participate and generate data. The resulting proposal was discussed and finally approved at the 56th EuroGeoSurveys Directors' General Meeting.
Based on this strategic decision, EGS and its member organisations agree on the following principles in relation to data generated in projects involving EGS members that produce pan-European or cross-border data where this data will be accessible on the Internet:

- The data must be accessible through EGDI, either by loading them into the EGDI databases or by linking them to EGDI
- It must be examined whether EGDI can be used as data platform for the project instead of developing its own
- The EGDI Operational Group must be consulted, if possible, at the project proposal stage to clarify whether EGDI should be used
- The EGDI Operational Group must assist the project participants in making the data available for EGDI
- If the project wishes to significantly extend EGDI capabilities, the EGDI Operational Group shall be invited to join the project consortium

Using EGDI as a data platform for these results is the best guarantee that the data will be as useful as possible for stakeholders, and that the results will be accessible in the long term.

3.2. Network of National Metadata Coordinators

Metadata describing data resources relevant to EGDI are stored in the EGDI Metadata Catalogue (https://metadata.europe-geology.eu/). Digital and structured information (e.g. spatial and non-geographic datasets or series of dataset and spatial data services such as Web Map Services (WMS), Web Feature Services (WFS), multidimensional models or other digital products (web applications, etc.)) is described by metadata in this catalogue.
EGDI is in operation since 2016. In the initial phase, a relatively large number of metadata records were entered but are no longer maintained for various reasons. In the GSEU WP7 work it was encountered a rather serious obstacle in improving the quality and FAIRness of data in EGDI. The biggest problem is with metadata quality - the problem that there was not one responsible contact person for metadata in each GSO, various people inserted metadata for project data, but never updated it when the project ended. For GSEU WP7 and SIEG, this meant time-consuming searching for contacts and emailing a lot of people, some of whom may no longer even work in the GSO or were not competent for the dataset. And there was no obligation for them to answer.
These were the main reasons to establish a Network of National Metadata Coordinators. The proposal was discussed and approved by 52 National Delegates Forum 01/2024. At the 56th EGS Directors' meeting in Rovaniemi, the Directors voted in favour of establishing this network to support the strategic ambition of developing EGDI as a central component of a future Geological Service for Europe. The National Metadata Coordinators should be assigned by the National Delegate, ideally from one of SIEG representatives. The National Metadata Coordinator is responsible for the content of all the metadata

provided to EGDI by the respective GSO. If a National Metadata Coordinator is not assigned, the role falls to the National Delegate.
To make this measure permanent, the rule was included to EGS Internal Rules in Article 11 on National Delegates: "…coordinate provision of national level metadata for agreed actions or designate a National Metadata Coordinator as the single point of contact to respond when needed to collect or update national level metadata for agreed actions…"
This text was approved by the EuroGeoSurveys Directors' meeting on 15 October 2024. 34 of EGS National Delegates responded to the call of the EGS Secretary General and nominated National Metadata Coordinators, in two cases the responsibility remained with National Delegates according to the rules.
This group is coordinated by SIEG. In collaboration with them, GSEU WP7 is working on improving the quality of metadata in the EGDI Metadata Catalogue.
The main focus in the next phase will be the revision of the content and quality control of the metadata in the EGDI Metadata Catalogue, the operation of the Helpdesk and the organization of trainings.

3.3. EGDI Editorial Board

For some years it has been clear that there is a need for a more formal engagement of the EGS Expert Groups in the operation of EGDI. EGDI is the infrastructure which supports the work and projects by all Expert Groups, and therefore these Groups shall have the control of which data EGDI shall contain and how the projects' results are disseminated through the EGDI platform. Expert Groups have a crucial role when it comes to ensuring the completeness and quality of EGDI.
Previously, the EGDI Operational Group, and to some degree the GeoERA projects and the GSEU WPs 2 – 6, have had influence on the content of EGDI. But to ensure that all Expert Groups can influence the content of EGDI it was suggested that an EGDI Editorial Board is established. At the 57th EGS Directors Meeting the Directors approved the Terms of Reference for an EGDI Editorial Board. This affects, and benefits the whole EGS community and it also requires engagement from the EGS Expert Group community.
The EGS Secretary General chairs the Board and the Chair of the EGDI Operational Group is Deputy Chair. A member of the EGS Secretariat is Secretary for the Board. The Board consists of one or two experts appointed by each Expert Group, that are expected to attend the meetings and to contribute to the tasks defined in the Terms of Reference. The first meeting of the Board will be held during the Expert Group Chairs meeting in Brussels on 11 March 2025.
The main mission and objective of the Board is to optimise the EGDI infrastructure to meet the needs of its users and promote reliable, relevant, high quality, and up-to-date information. The Board must carry out the following tasks:

- Content Curation: The Board selects and curates relevant and valuable content for inclusion in the EGDI infrastructure. They assess the information's relevance before adding it to the infrastructure.
- Quality Control: Ensuring the information's accuracy and credibility is paramount. The Board must define and implements quality control measures, fact-checks, and periodically review content to maintain a high information standard. The quality control measures and procedures must be defined in a collaboration with the EGDI Operational Group.
- Compliance and Ethics: The Board must ensure that the content adheres to legal, ethical, and copyright guidelines. Plagiarism and intellectual property violations must be avoided, and appropriate credits given where necessary.

- Identification of Knowledge Gaps: The Board must identify areas of knowledge gaps and works towards filling them with relevant and well-researched content. They may also collaborate with other subject matter experts and researchers to generate new insights.
- Collaboration and Partnerships: The Board may collaborate with academic institutions, organisations, and other stakeholders to strengthen the knowledge infrastructure's content and reach.
- Prioritisation: The Board will prioritize tasks based on available resources for practical implementation.

The proposal is to a high degree in line with the proposal for a Data editing committee described in the GSEU report D9.8, “Technical report on the feasibility and functional structure of the Geological Service for Europe v1”.

4. Process for the Establishment of a Geophysics Expert Group

Geophysics plays an important role within the CRMA and NZIA. CRMA Art. 19-1 (Regulation (EU) 2024/1252) states that Member States “shall draw up a national programme for general exploration targeted at critical raw materials and carrier minerals of critical raw materials” by 24 May 2025, whereas Art.19-2 (c) explicitly mentions geophysical surveys as one of the measures to be applied as well as Art.19-2 (e), where “reprocessing of existing geoscientific survey data” is mentioned.
NZIA Art. 21/1 a and b (Regulation (EU) 2024/1735) states that, among others, geophysical data on possible CO_2 storage sites have to be made publicly available, whereas an accompanying guidance document from DG CLIMA (Annex 2) explicitly recommends (3.1) a mandate for the national GSO to collect these data and also defines the necessary (geophysical) data types (3.2).
Consequently, for fulfilling the CRMA and the NZIA, a focused expertise in geophysics is needed. However, such an expertise is important not only for mineral exploration and carbon capture and storage (CCS) but is essential also for other topics, e.g. groundwater/geothermal energy exploration and natural/anthropogenic hazard mitigation. Therefore, geophysical expertise is indispensable for reaching the goals of the European Green Deal. GSOs could provide such a focused expertise. Although it is the responsibility of the nation states to fulfil the requirements of the CRMA and NZIA, the future GSE could significantly contribute to enable the individual states to fulfil these requirements by enhancing the internal cooperation between GSOs. This could lead to an increased exchange of experiences and knowledge or even to an internal market space between GSOs.

4.1. Is there sufficient expertise in geophysics among the GSOs?

The most important question was if there is enough geophysical expertise available at all among the individual GSOs that it is justifiable to further develop this expertise.

In order to estimate how many experts in the GSOs perform which geophysical applications or methods a questionnaire was designed by GeoSphere Austria in May 2023. Also the general interest in collaborating within the GSOs and additional information and types of activities (observation, modelling, prediction etc.), should be assessed. As a first step internal feedback from geophysicists at GeoSphere Austria was collected, then, experts in geophysics within the GSOs were asked for their input; 8 institutes sent suggestions on how to improve the questionnaire or pointed out, which applications, methods or other information were missing (June 2023). The feedback was included, adding for instance a method group on petrophysics, some more methods (e.g. echosounding) and several applications (hydrocarbons, carbon capture/storage, anisotropy etc.) and asking information on survey platforms or configurations. Also the question on data availability was added and general clarification was ensured. The final version of the questionnaire was sent to 38 organisations and the National Delegates at the end of July 2023. A reminder to complete the form was sent on 8th August 2023 and qualitative evaluation was started in late August.
Robert Supper presented the first results at the National Delegates Forum on 12th September 2023. After that, we were still receiving completed questionnaires, 26 in total. In addition to the evaluation, a list of locations of expert groups and contact information per method group was started, to be included in the future expertise Search Service.

The questionnaire contains questions on:

- Total number of geophysical staff and staff specification,
- 13 method groups comprising 50 methods: e.g. electromagnetics, (spectral) induced polarization, magnetic total field/declination / inclination measurements, reflection / refraction seismics, absolute / relative gravimetry, array / broadband seismology, gamma ray spectroscopy, single / multiple channel ground penetrating radar, near / short wave infrared, photogrammetry, echosoundig, determination of density, porosity, hydraulic permeability,…
- 26 applications per method: e.g. geological mapping / geomorphology, groundwater, raw materials, geothermics, archaeology, earthquakes / faulting,...
- 9 activities: e.g. interpretation, inversion / modelling, monitoring,...
- platform / survey configuration (airborne, marine, ground-based, laboratory),
- contact information and (interest in) cooperations,
- data availability and funding.

Table 1. Method groups

Method Groups	
1	electric
2	geomagnetism
3	rock, paleo, environmental magnetism
4	gravity
5	seismology
6	active seismics
7	radiometry
8	ground penetrating radar
9	infrared
10	microwave
11	determination of petrophysical properties
12	space weather
13	others

Simply adding up reveals, that there is ample expertise in geophysics among the GSOs: Several hundred geophysicists and as well hundreds of persons with other geophysical training work in the European GSOs and perform methods and applications from all 13 method groups.

4.2. Evaluation of the questionnaire and presentation of results

The methods (50 within 13 method groups), applications (out of more than 25) and activities (9) performed per organisation were assessed. Also, the general interest in collaboration and contact information per method group were requested and an informational sheet on the classification or weighting technique was given, to get an idea how regularly methods are applied (see questionnaire in annex 2 for details). Additionally, we compiled some basic statistical data.

4.2.1. Staff specification and numbers

In percentage of the total number of employees (793 at 26 organisations, 2023) 59,4% experts and 40,6% persons with other geophysical training operate in the GSOs. That gives an average of 18 experts and 12 persons with other training per GSO. The most powerful surveys in terms of staff with geophysical expertise plus persons with other geophysical training are the German BGR, the French BRGM and GTK Finland (60+40 persons each), followed by Geosphere Austria (50+15 persons), BGS (40+20 persons), and IGME Spain (39+16 persons). The smallest groups of geophysicists operate within CSD Malta (1+1 persons), LfU Bavaria (1+2), GSI and KGS (1+3 persons), followed by SGL (2+2 persons).

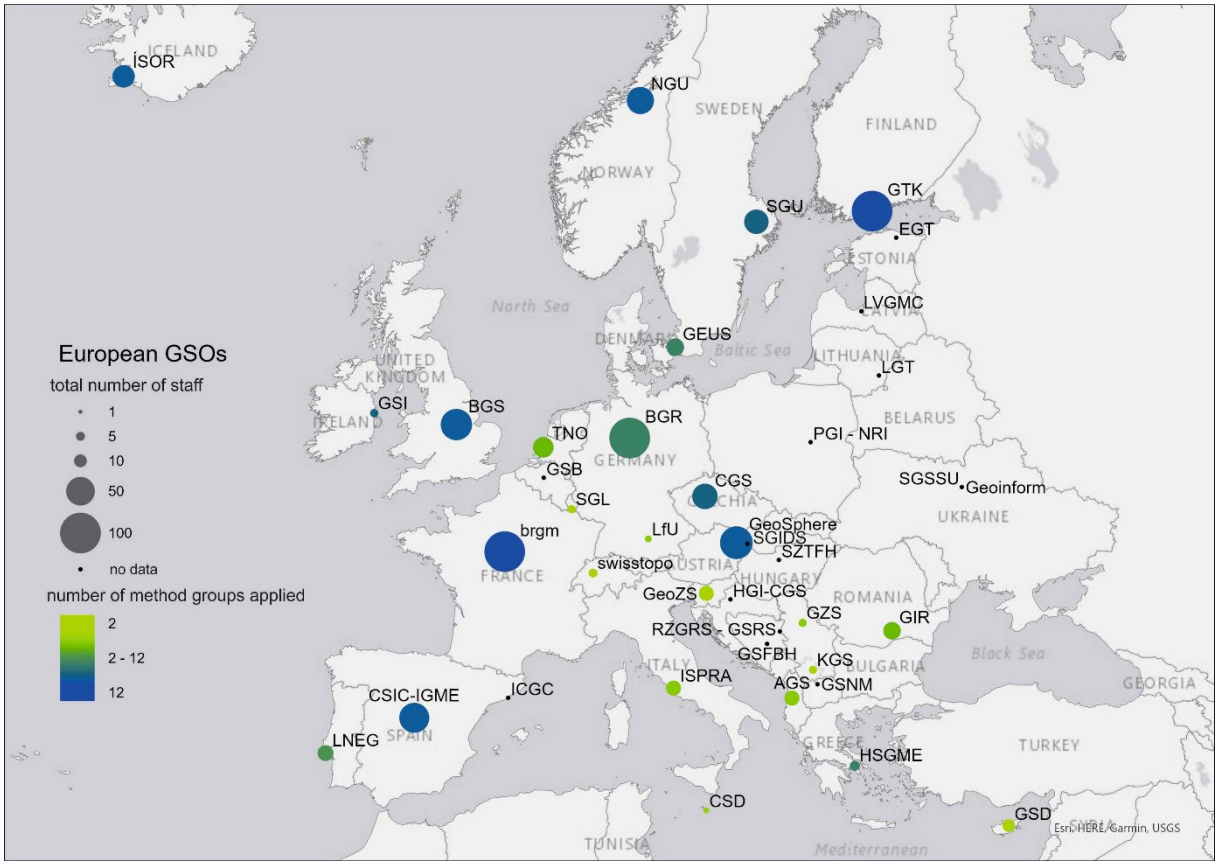

Figure 1. Map with indicated number of staff and number of applied method groups per GSO

4.2.2. Comparison of staff numbers and performed method groups

The big surveys may apply a wide range of geophysical methods, whereas the smaller ones have to focus on a smaller amount of methods and applications or even single ones. Malta for instance (1+1 persons) seems to have a clear focus on active seismics and interpretation of other geophysical methods for hydrocarbon exploration. Ireland (1+3 persons) is an example for a small survey applying an astonishing amount of method groups, 10 out of 13. Also Greece (4+2 persons) applies methods out of 8 method groups.

On average, each GSO is able to perform applications out of 7 method groups, though not even one stated, that applications out of all method groups are performed – the biggest GSOs perform applications out of 12 method groups. The most common method groups are active seismics, which 85% of the GSOs are conducting and electrics, applied by 81%. The rarest method groups are space weather observations, applied by 23% and infrared applications (by 27%). The opportunity to indicate how regularly methods are applied by classifying with 0=never, 1=sporadically, 3=several times per year or 5=regularly (for details see questionnaire in annex 2), slightly changes the picture; the highest-weighted expertise among all GSOs lies in the electrics method group, with 3,31 on average, followed by active seismics (2,92) and geomagnetism as well as the others method group (both 2,88). Figure 4 shows pie charts of applied method groups for every GSO, the chart size and slice size is given by the weighted expertise per method group (CSD, for example, classified gravity and geomagnetism with 1=sporadically, active seismics with 5=regularly).

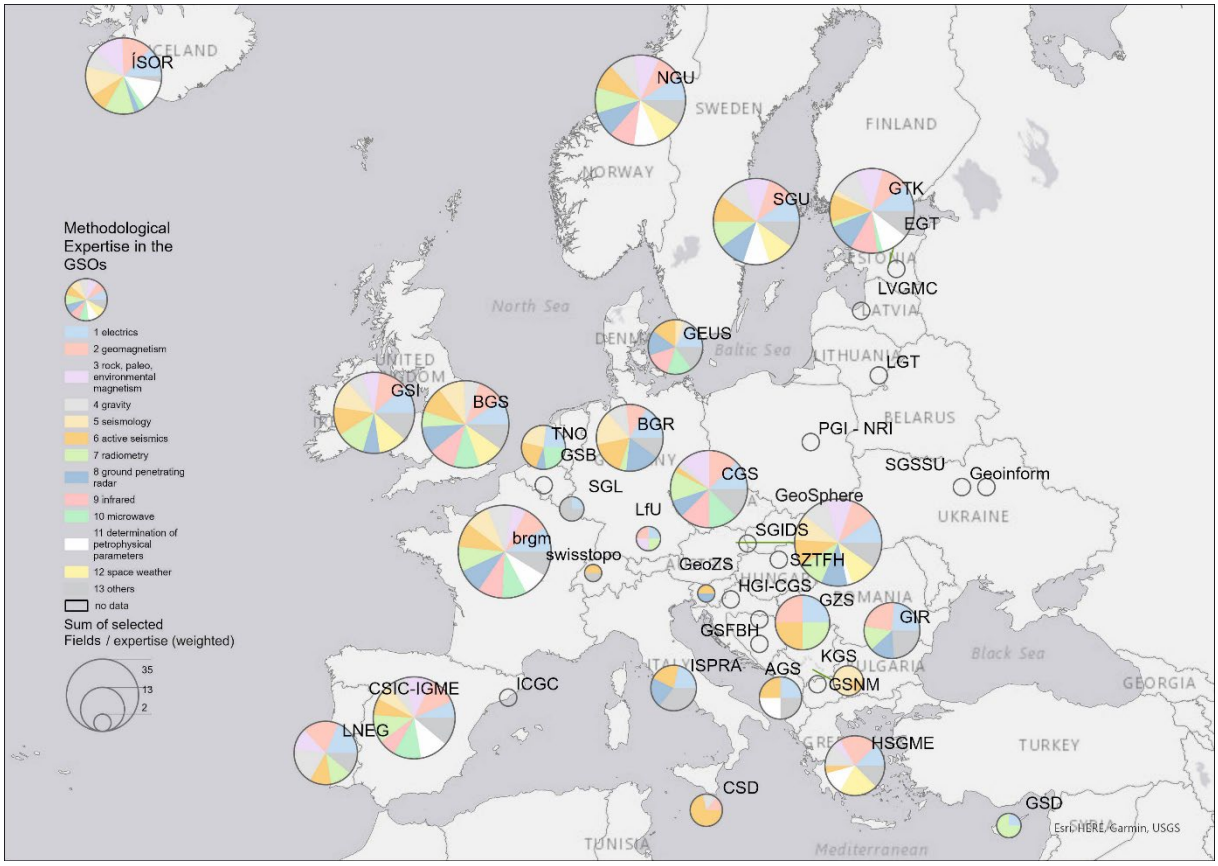

Figure 2. Map of weighted expertise per GSO

4.2.3. Cooperations throughout Europe

88% of all organisations are interested in cooperating within the GSEU framework, either in providing service or renting equipment or providing commercial services via a future GSE market space. Many GSOs do not have the legal requirements to offer commercial services, though. Some stated, that they are already cooperating with other GSOs, these are Albania, Britain, Cyprus, Czech Republic, Denmark and Spain. Austria and Greece did not state, that they were already cooperating, but both joined a consortium of experts answering Cyprus‘ request regarding the Pissouri landslides (see below).

All in all, the numbers of employees working in geophysics within the GSOs, the wide range of expertise and the amount of methods applied throughout Europe are remarkable.

Table 2. Questionnaire results for staff numbers of geophysical experts and employees with other geophysical training, applied method groups and interest in cooperation per country’s GSO. Method groups number codes in Table 1, country codes in appendix

COUNTRY		STAFF		METHOD GROUPS	LEGAL RE-QUIREM.	INTEREST IN COOPERATION	
code	GSO	geophys.	other tr.		commercial collab.	providing	renting
FI	GTK	60	40	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13	1	1	1
FR	brgm	60	40	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13	1	1	0
AT	GeoSphere	50	15	1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13	?	1	0
ES	CSIC-IGME	39	16	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 13	0	1	0
GB	BGS	40	20	1, 2, 4, 5, 6, 7, 8, 9, 10, 12, 13	1	1	1
IS	ÍSOR	11	19	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	1	1	1
NO	NGU	25	20	1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 13	0	1	0
CZ	CGS	20	19	1, 2, 3, 4, 6, 7, 8, 9, 10, 13	?	1	0
IE	GSI	1	3	1, 2, 3, 4, 5, 6, 7, 8, 12, 13	0	0	1
SE	SGU	18	18	1, 2, 3, 4, 6, 7, 8, 11, 12, 13	0	0	0
DK	GEUS	11	8	1, 4, 5, 6, 8, 9, 10, 13	0	1	1
DE	BGR	60	40	1, 2, 4, 5, 6, 7, 8, 13	0	1	0
GR	HSGME	4	2	1, 2, 3, 4, 6, 11, 12, 13	1	1	1
PT	LNEG	10	5	1, 2, 3, 4, 6, 7, 13	1	1	1
NL	TNO	14	12	1, 5, 6, 8, 10	1	1	1
RO	GIR	14	5	1, 2, 7, 8, 13	1	1	0
AL	AGS	4	10	1, 6, 11, 13	1	1	1
IT	ISPRA	10	4	1, 6, 8, 13	0	1	0
RS	GZS	2	2	1, 2, 6, 7	0	1	1
MT	CSD	1	1	2, 4, 6	0	0	0

CY	GSD	5	5	1, 7?	0	1	1
XK	KGS	1	3	5, 6	1	1	0
LU	SGL	2	2	1, 13	0	1	0
SI	GeoZS	7	7	6, 8	1	1	0
CH	swisstopo	0	5	6, 13	0	1	0
DE-BY	LfU	2	1	1, 2, 3, 7	0	0	0

4.3. Process of the establishment of a Geophysical Expert Group

At the 57th EGS General Meeting on October 15, 2024 in Brussels, the Directors finally voted in favour of establishing a new EGS Expert Group on Geophysics after an intensive discussion. Consequently, the national delegates were consulted to provide a list with the names and contact details of those people you wish to join this expert group by November 22, 2024. The designation of the expert group lead and the first expert group meeting are expected to take place in spring 2025.

4.4. Outlook

In 2025 the expert group will be established and the kick off meeting for this group is scheduled in the first half of 2025 to take place in Vienna.
In order to enhance the internal cooperation possibilities of the expert group, the implementation of questionnaire results within the expertise hub is planned for 2025.
It is suggested, apart from administrative issues, to focus the scientific discussions in 2025 on the use of artificial intelligence, the use of drones as well as the implementation of the CRMA and NZIA.
As regards the implementation of the NZIA another important early task requested to the group by the Secretary General of EGS is the discussion and potential contribution to the implementation of an airborne magnetics layer on EGDI. GeoSphere Austria has been involved in discussion about this via their involvement in the EPOS ON project and would like to deliver the layer to EPOS via EGDI if possible.

5. Networking the geological services of the east-central European states to implement the CRMA

In 2024 the European Critical Raw Materials Act (CRMA), as an initiative of the European Commission, was enacted. It serves as a legislative basis for a resilient critical raw materials supply chain in Europe and aims to lower the dependency on imports from single country suppliers. The Geological Services play an important role in this direction as they gather and evaluate geological and geophysical data which is fundamental for achieving the goals set by the CRMA.
In order to intensify the transboundary coordination of actions in the frame of CRMA GeoSphere Austria started a discussion group with representatives from the Geological Surveys of Croatia, Czech Republic, Germany, Hungary, Italy, Slovakia and Slovenia.
The first meeting took place on the 4th of June 2024 in Vienna. The main focus was to inform about national strategies and to find possibilities for cooperation concerning critical raw materials. The second meeting with a more technical approach was also held in Vienna on the 18th of November 2024.

5.1. Outcome

The two meetings served as a valuable information forum to get up to date. There is a strong interest in cooperation. In general, the following topics are seen as interesting for the involved Geological Surveys.

Table 3. Ideas for cross-border ore deposit / mineralization potential studies

Ideas		Possible research partner
Ideas for cross-border ore deposit / mineralization potential studies:		
• Au-Co-Ni orogenic mineralisation in Variscan (HU)		
CZ: in southern Bohemia Ni-Co has been mined historically		
(Note: CZ is a Partner in Horizon Europe SEMACRET project: sustainable Exploration for Critical Raw Materials (2022 - 2025))		
• S+E Alps (Pb-Zn alpine type, pegmatites)		AT-SI-partner from Northern Italy
metallogenetic modelling	a) find exploration potentials	
	b) define tools for finding deposits	
	c) are deep crustal structures (< 10km) important? - seismic profiles	
• Cross border harmonized geological map for Bohemian Massif		CZ-BY-AT-SN-PL
(required scale 1:50 000)		
• Mineral system approach in exploration for mineralization in Bohemian Massif such as:		AT-BY-CZ
(Principle aim: Develop cross-border "geology based" exploration models and tools)		
	a) W (Scheelite) deposits	
	b) Grafite (e.g. geoelectric measurements for 3D information)	
	c) Pegmatites - utilize/extend on GREENPEG (New Exploration Tools for European Pegmatite Green-Tech Resources (2021 - 2024)) results (target depth range 10 to >100m ?); geochemical exploration	
	d) magmatic-hydothermal mineral deposits (e.g. greisen, prophyry, skarn)	
• Geothermal resources + Li potentials in geothermal/formation water	HU: inhouse seismics group incl. field measurements ("hydrocarbon exploration tradition")	AT-HU-SI-HR (SK-PL)
Geophysics:		
• Geophysics "tailor made" - methods and resolution we need	different mineralization targets require different geophysical methods / resolutions in order to define ore deposit related anomalies	
• SI: General need for aerogeophysical measurements		

A poll among the participating Geological Surveys after the first meeting resulted in the selection of 4 different topics for a more detailed discussion during the second meeting. The technical areas of common interest were UNFC, Aerogeophysics, Cross-border geological, geochemical, geophysical data harmonisation, geological map harmonisation and Regional prospectivity – mineral mapping. The chosen regions for those topics were the Southern Bohemian Massif, the Southern / Eastern Alps and the Pannonian Basin.

5.2. UNFC (United Nations Framework Classification)

UNFC approaches are border crossing. The Czech Republic has two strategic projects concerning UNFC. In general, the national reporting system should be known very well in advance to find the appropriate approach to UNFC. Different countries have their own classification systems that need to be translated/bridged to UNFC. The **European Centre of Excellence on Sustainable Resource Management"** situated in **Ljubljana** offers help in preparing the bridging documents and organizes exchange between people working on it (Knowledge Hub).
Artificial Intelligence is not usable at the moment, probably it could be in the future. The Classification itself is comprehensive, when going to the details certain issues may appear that need to be solved and aligned. FUTURAM project works on UNFC for secondary mineral resources. UNFC is also used for geothermal energy and groundwater. UNFC could be extended to cover CCS as well.

5.3. Aerogeophysics (including drones)

Austria: In Austria from 1980 to 2014 approx. 20% of the country were covered with helicopter-based geophysics at 200 m / 100 m line spacing by magnetics, frequency domain electromagnetics and gamma ray. Geophysical measurement results also exist for the Weinebene / Koralpe in Austria from the Horizon Europe Project GREENPEG (New Exploration Tools for European Pegmatite Green-Tech Resources (2021 - 2024)).
Today the question at GeoSphere Austria is, if the helicopter-based equipment should be updated or if the focus should lie on developing the drone-based investigations instead. Discussions are on-going. GeoSphere Austria is open for all kinds of cooperation.
The equipment used in Austria can be easily mounted on a helicopter. Commonly, no extra permitting is required. Also an option: Data quality assessment and planning of commercial surveys in cooperation with partners in adjacent countries.
Gamma ray and electromagnetics coverage for all of Europe should be a focus of EGS activities. This would involve the definition of already existing areas of expertise at Surveys that should be matched.
Hungary: Is open for cooperation. Discussions regarding the focus of future activities are on-going – not only in connection with CRM but also on aggregates and building materials. To find the funding and the right setting for the geophysical measurements could be difficult. A bilateral cooperation is a possibility. It would be interesting to build in geophysics education.
In general, there is a need for aerial geophysics in Hungary, although old data is still existing. The Hungarian Geological Survey could offer strong ground based geophysics including seismic surveys in exchange. A cooperation with a Hungarian University is possible as well.
Slovenia: Geophysics is part of the exploration program plan. The idea is a country wide coverage in lower resolution and some areas with more detailed (ground based) investigations. The budget is still undecided and geophysics are the most expensive component of the NEP (National Exploration Program). At GeoZS geophysics must be outsourced and normal public procurement procedures must

be followed. There are neither geophysical instruments nor is there geophysical expertise at the Survey. Focus areas are located along the border with Austria.
Italy: Italy will choose 20 pilot areas. The investigations - geophysical and geochemical - will be outsourced. There are no in-house geophysical measurement capabilities. Old data is only available on pdf files, not the data itself.
Czech Republic: The access to geophysical data is linked to the question of usage. Scientific: Free of charge. Commercial: A fee must be paid for the access to the data. From the past there is already quite a big amount of data available on the Surveys website. All territory is covered by gamma ray and magnetometry due to Uranium exploration during Eastern Europe times, not always covering the border areas. A current development is the linkage with satellite data including ground testing of anomalies defined by satellite geophysical measurements. Minor areas are covered by drone geophysics.

5.4. Cross-border geological, geochemical, geophysical data harmonisation, geological map harmonisation

A cross-border collaboration between AT-CZ with a small grant for joint field activities exists and has been used during 2024. The right scale for „mineral system analysis“ is at least 1:200 000 scale or more detailed.
The vocabulary and data structure are the focus of geological data homogenization activities of the Mapping Expert Group.
In case of the Bohemian Massif in the Czech Republic it is pointed out, that there are 5 different maps from different schools and with different scientific concepts, which are very difficult to homogenize. Therefore, it might be easier to work on geochemistry and geophysical data instead. Practical subject: Highly evolved granites on the border to Austria are a potential source of many CRM. Deposit specific investigations of mineralization potential in cross border collaborations would enhance a common understanding of mineralization processes in a harmonized geological framework. Collaboration and data sharing need to be agreed on by the management, otherwise there might be difficulties in practice.
In Hungary there are restrictions regarding funding from a third party because the Survey is part of the National Ministry which receives national basic funding.

5.5. Regional prospectivity – mineral mapping

GIS tools are in use for regional prospectivity mapping in Sweden and Finland. The concept aims to determine the probability of certain commodity / mineralization style being present. This is dependent on the recognition and evaluation of certain mappable criteria that are specific to a particular mineral deposit type.
In Hungary Potential / Prospectivity maps for Hydrogen, Helium, CCS Potential are planned within the next 2 years. They will be installed in a particular data room, for investors to view. This has already been carried out for Hydrocarbon potential areas in Hungary.
There has been some knowledge transfer from GTK (Finland) to the Czech Geological Survey within the scope of the Horizon Europe SEMACRET project on sustainable Exploration for Critical Raw Materials concerning ultramafic rocks. However, this is not a standard procedure at CGS today.
Activities within GSEU are concentrated on mineral mapping on a big scale. Hence, there is room and demand for collaborative studies in certain focus areas on a regional scale.

5.6. Outlook

Finally funding opportunities were discussed in order to generate continuity in this format of exchange of the involved Geological Surveys. The **COST action** as an EU funding tool for coordination in science and technology was considered as an appropriate possibility. It enables networking; meetings, workshops and „short term scientific missions“. Financial support for organizational expenses, travel costs for participants (flat rate per day + mobility) are funded but no costs for personnel.
Hence, it is possible to use the COST action workshops in order to get experts from GTK and / or SGU and / or GEUS involved in mineral system based potential analyses in a cross border collaborative framework. So, that prospectivity assessment is carried out in a consistent fashion in one geological framework. Project proposal development is a main purpose / deliverable of the COST action. So this would feed well into ideas regarding cross border initiatives for collaboration.
As concrete steps for collaboration the delegates need to check with their management regarding the general concept of generating funding for cross-border collaboration such as an InterReg project.
For example:

- Is there an interest in generating a cross border harmonized geological map for the Bohemian Massif?
- The Data set for „One Geology“ is on 1 : 1 000 000 scale. For smaller scales there are developments to prepare work procedures by the Mapping Expert Group.

In case of airborne geophysics the “Metadata – Database status” in the different Geological Surveys has to be identified.
The next meeting at the end of March 2025 is planned online. In addition to the information about the further development of the national exploration programs there will be also the final discussion about an InterReg and or Cost action etc. project.

Table 4. Summary of existing CRM/Raw Material cross-border cooperations/exchange

Country	Cooperation/Exchange
AT-DE(BW-BY)-CH	annual group meeting in autumn
AT-CZ	• annual meeting (geoscience is part)
	• geology research cooperation (travel/mobility grant) 2024-2026
EGS	MREG/GSEU-WP2 Horizon Europe
CZ-SN	Horizon Europe Deepbeat 2025-2028 (for hidden mineralization)
SK-AT	Horizon Europe START project (tailings)
SI	SIMONA geochemical stream sediment investigation (hugh database with stream sediment analyses); EGDI has to be used;international cooperation; Interreg
AT (Leoben MUL)-SI	MURmap (environment, geochemical mapping) CEUS-PROGRAMM (ARIS – FWF)
HR	•SIMONA geochemical stream sediment investigation; Interreg
	•Inoset (SIMONA continuation) Interreg
	•Interreg Hydrogeology
HU	no existing cooperations yet, but opening-up internationally

6. The joint field mission in Pissouri: lessons learned, the path towards a future market space?

In today's complex research landscape, highly specialised research methods are necessary in order to be able to provide the reliable, high-quality data required to solve the challenges facing society. No single GSO can provide all these methods itself with the necessary quality or maintain such expertise. National geological services often have very differentiated competences and are specialised in some core methods. It would therefore make sense to pool these competences and make them available to other GSOs as part of an internal market space of the future GSE. In an ideal situation, each GSO would focus on specific methods that it operates with high quality. If methods are required that a GSO does not operate, these could be purchased from other GSOs in the internal market space under special conditions.

As part of this activity in Task WP 9.1, we want to investigate whether and under what conditions such a market space can function within the frame of a future GSE and whether it is desired by the GSOs at all.

As part of a request from the Geological Survey Department of Cyprus (GSD), a pilot study has coincidentally arisen during the GSEU project period, in which various GSOs contribute with their special competences to the solution of an applied question. Within the aim of this project the combined expertise of several GSOs shall contribute to the development of a remediation concept for the landslide in Pissouri, as small town in Cyprus, that was continuously impacted by sliding processes. In principle, this assignment represents the first pilot use case for a potential internal market space and therefore offers the ideal opportunity to derive the framework conditions for the functioning of such co-operations and derive lessons learned through ongoing monitoring of the project.

Due to the fact that the kick-off of the project was delayed, the full evaluation of the pilot has to be foreseen for deliverable 9.1/2.

6.1. Monitoring of the timeline of project execution

To derive lessons learned it was necessary to monitor the project timeline. Here the important dates of the first project phase are given.

01/09/2023: Request from Geological Survey of Cyprus (GSD)

Christodoulos Hadjigeorgiou, the Director of GSD contacted EGS via Julie Hollies, asking for support in assessing two landslides at Pissouri, close to the southern coast of Cyprus. There, the District Authority started to build retaining walls and structures in the 2010s as suggested by geotechnical engineers. It still remained unclear, whether these constructions could stop the sliding sustainably, since geological information on the deeper underground (rocks, depth and thickness of gypsum layers, karst, groundwater,…) is rare and mostly punctual (boreholes). A consortium of experts should be able to assess deeper structures to support decision making of GSD and, in particular, the local government.

12/09/2023: The request was discussed at the National Delegates Forum. Eleftheria Poyiadji, chair of EOEG, was assigned to coordinate a group of experts, eager to contribute to the investigations.

27/09/2023: In a first meeting the problem was presented in detail by GSD. BGS (UK), HSGME (Greece), IGME (Spain) presented first suggestions on methodology. These were discussed by the consortium's experts, who then agreed to send their proposals and first cost estimates.

13/10/2023: The proposals were evaluated in a follow-up meeting of all collaborating experts and an overall plan was established by Eleftheria Poyiadji. Single expert groups then discussed their approaches in group meetings, e.g. geophysicists on 16/10/2023.
12/2023: First field trip to Pissouri (GeoSphere Austria, BGS, HGSME, Cyprus), fact finding mission
05/04/2024: submission of the technical and financial proposal by EGS to GSD
15/04-02/05/2024: first field survey, geoelectrical surveying by GeoSphere Austria in agreement with GSD
15/07/2024: Contract negotiations finalised, contract between GSD and EGS signed on July the 15th, start of the project,
19/07/2024: kick-off meeting
03/12/2024: First deliverables submitted

6.2. Fist findings

Within this chapter we will focus on some strategically important issues of the first project phase.

Who should put together the consortium?

Different GSO can offer different competences. However, for a specific topic it is difficult to decide on the composition of the optimum partnership and the availability of resources. There are various options for how to proceed here.
The client could put together their own consortium based on the data available in a knowledge hub or based on personal relationships or past collaborations. However, this is a complex process that requires a lot of administrative work from the client and also requires specific competences.
In this case, also because a knowledge hub is not yet available and direct awarding was administratively very complex based on national legal conditions, a different approach was taken. EGS commissioned the Earth Observation and Geohazards Expert Group (EOEG) to put together a consortium on the basis of internal discussions in this group and to submit a joint offer.
The advantage of this approach is that the availability of resources within the consortium is clarified during the compilation phase and the client does not have to coordinate directly with each individual sub-contractor.
It can be concluded that this approach worked very well and that a competent consortium could be put together in a short time. The client was directly involved in the compilation process.

Contract negotiations
The contract negotiations proofed to be specifically delicate, since EGS had to negotiate with GSOs in many different countries, even outside of the EU, based on different legal backgrounds. On the other hand, the tender documents were designed for economic entities, whereas in this specific case the negotiation was with a non-profit organization. Therefore, many terms had to be modified. The process took a long time, but a lot of experience was gained that can be used in a further contract, which could significantly speed up the process in the future.

Delay in start of the field missions
Due to the delayed kick-off of the project postponed to July, most of the field measurements has to be shifted to the autumn / winter period since especially geoelectric measurements require some humid soil condition at the surface in order to guarantee high quality data. Additionally, the presence of poisonous snakes has severely restricted the accessibility of the area for measurements. Therefore, we had to wait for the first autumn rains to start with most of the field works. In order not to delay the

completion of the project, certain measurements were therefore carried out before the project was commissioned as part of an internal agreement, which should not occur as a rule.
We conclude that to guarantee a high data quality and to make such an international cooperation of GSOs efficient it is essential to speed up the allocation process. Additionally, potential delays due to unfavourable environmental conditions have to be communicated with the client as early as possible. These must be clarified in an on-site inspection before submitting an offer, which proofed to be very effective in this pilot study.

6.3. Outlook and preliminary conclusion

The Pissouri project will be finalised in spring 2025. We will further accompany the project and finally derive a report on “lessons learned and conclusions for the setup of a possible market space" within the planned GSE. Up to now, based also on the communication with the commissioning party, we can conclude that in such a project the interaction of interdisciplinary expertise plays an important role. The Pissouri project proves that. Mapping, geotechnical, hydrology, geophysics etc. experts were involved.
The contract was designed more as a cooperation – partnership project rather than just a business act. It was important that the commissioning party was able to provide good quality base information but at the same time to be able to produce complementary data during the project (i.e. new verifying boreholes and new data) which can assist the experts to provide the best possible results.
These parameters, in the opinion of the commissioning party, can only be provided by the GSOs. This fact emphasises the necessity for a future GSE as well as it underlines the importance of including a kind of “internal market space” in a future GSE.

7. Conclusions

The activities and initiatives outlined in this deliverable highlight the significant progress made towards establishing a more integrated and efficient Geological Service for Europe (GSE). Through strategic networking, clustering actions, and the implementation of tools like the Expertise Search Service, a strong foundation has been laid to enhance cooperation among Geological Survey Organisations (GSOs). These efforts are pivotal in addressing critical challenges such as climate change mitigation, sustainable resource management, and the implementation of European policies, including the Critical Raw Materials Act (CRMA) and the Net Zero Industry Act (NZIA).

A key achievement in this project has been the development of structured frameworks for collaboration, notably through the EGDI editorial board and the network of national metadata coordinators. These initiatives ensure the long-term sustainability and accessibility of geological data, reinforcing the role of GSOs in providing reliable, up-to-date, and harmonized information. The establishment of an expert group for geophysics is another milestone, reflecting the recognition of geophysical research as a cornerstone in supporting the European Green Deal and other policy objectives.

Moreover, the success of the networking efforts among Central-Eastern European GSOs demonstrates the value of regional cooperation in implementing the CRMA. The cross-border harmonization of geological, geochemical, and geophysical data, as well as joint exploration initiatives, pave the way for a more coordinated and effective approach to mineral resource management.

The Pissouri field mission serves as a model case study for collaborative problem-solving within the GSE framework. It underscores the importance of interdisciplinary expertise and the potential for an internal market space where GSOs can exchange specialized services and capabilities. The lessons learned from this initiative provide valuable insights into optimizing contractual agreements, streamlining project execution, and ensuring high-quality data collection under real-world conditions.

Looking ahead, the continued refinement of these frameworks and tools will be crucial in advancing the vision of a Geological Service for Europe. The integration of emerging technologies, the expansion of thematic expert groups, and the strengthening of governance structures will further enhance the effectiveness of GSE.

In conclusion, this deliverable underscores the essential role of GSOs in shaping a resilient and sustainable future for Europe’s geological services. By fostering collaboration, innovation, and data-driven decision-making, the groundwork has been set for a more cohesive and impactful Geological Service for Europe. Continued engagement, refinement of strategies, and adaptation to evolving challenges will be key to realizing the full potential of this initiative.

9. References

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10. Annex I – Consortium Partners

	Partner Name	Acronym	Country
1	EuroGeoSurveys	EGS	Belgium
2	Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek	TNO	Netherlands
3	Sherbimi Gjeologjik Shqiptar	AGS	Albania
4	Vlaamse Gewest	VLO	Belgium
5	Bureau de Recherches Géologiques et Minières	BRGM	France
6	Ministry for Finance and Employment	MFE	Malta
7	Hrvatski Geološki Institut	HGI-CGS	Croatia
8	Institut Royal des Sciences Naturelles de Belgique	RBINS-GSB	Belgium
9	Państwowy Instytut Geologiczny – Państwowy Instytut Badawczy	PGI-NRI	Poland
10	Institut Cartogràfic i Geològic de Catalunya	ICGC	Spain
11	Česká Geologická Služba	CGS	Czechia
12	Department of Environment, Climate and Communications - Geological Survey Ireland	GSI	Ireland
13	Agencia Estatal Consejo Superior de Investigaciones Cientificas	CSIC-IGME	Spain
14	Bundesanstalt für Geowissenschaften und Rohstoffe	BGR	Germany
15	Geološki zavod Slovenije	GeoZS	Slovenia
16	Federalni Zavod za Geologiju Sarajevo	FZZG	Bosnia and Herzegovina
17	Istituto Superiore per la Protezione e la Ricerca Ambientale	ISPRA	Italy
18	Regione Umbria	-	Italy
19	State Research and Development Enterprise State Information Geological Fund of Ukraine	GIU	Ukraine
20	Institute of Geological Sciences National Academy of Sciences of Ukraine	IGS	Ukraine
21	M.P. Semenenko Institute of Geochemistry, Mineralogy and Ore Formation of NAS of Ukraine	IGMOF	Ukraine
22	Ukrainian Association of Geologists	UAG	Ukraine
23	Geologian Tutkimuskeskus	GTK	Finland

24	Geological Survey of Serbia	GZS	Serbia
25	Ministry of Agriculture, Rural Development and Environment of Cyprus	GSD	Cyprus
26	Norges Geologiske Undersøkelse	NGU	Norway
27	Latvijas Vides, ģeoloģijas un meteoroloģijas centrs SIA	LVGMC	Latvia
28	Sveriges Geologiska Undersökning	SGU	Sweden
29	Geological Survey of Denmark and Greenland	GEUS	Denmark
30	Institutul Geologic al României	IGR	Romania
31	Szabályozott Tevékenységek Felügyeleti Hatósága	SZTFH	Hungary
32	Eidgenössisches Departement für Verteidigung, Bevölkerungsschutz und Sport	VBS (DDPS)	Switzerland
33	Elliniki Archi Geologikon kai Metalleftikon Erevnon	HSGME	Greece
34	Laboratório Nacional de Energia e Geología I.P.	LNEG	Portugal
35	Lietuvos Geologijos Tarnyba prie Aplinkos Ministerijos	LGT	Lithuania
36	GeoSphere Austria - Bundesanstalt für Geologie, Geophysik, Klimatologie und Meteorologie	GeoSphere Austria	Austria
37	Service Géologique de Luxembourg	SGL	Luxembourg
38	Eesti Geoloogiateenistus	EGT	Estonia
39	Štátny Geologický ústav Dionýza Štúra	SGUDS	Slovakia
40	Íslenskar Orkurannsóknir	ISOR	Iceland
41	Instituto Português do Mar e da Atmosfera	IPMA	Portugal
42	Jarðfeingi	Jardfeingi	Faroe Islands
43	Regierungspräsidium Freiburg	LGRB	Germany
44	Geologischer Dienst Nordrhein-Westfalen	GD NRW	Germany
45	Landesamt für Geologie und Bergwesen Sachsen-Anhalt	LfU	Germany
46	Vlaamse Milieumaatschappij	VMM	Belgium
47	Norwegian Petroleum Directorate	NPD	Norway
48	United Kingdom Research and Innovation - British Geological Survey	UKRI-BGS	UK

11. Annex II – Country Codes

COUNTRY CODE	COUNTRY
AL	Albania
AT	Austria
CH	Switzerland
CY	Cyprus
CZ	Czechia
DE	Germany
DE-BY	Bavaria, Germany
DE-BW	Baden-Wuerttemberg, Germany
DE-SN	Saxonia, Germany
DK	Denmark
ES	Spain
FI	Finland
FR	France
GB	Britain
GR	Greece
HR	Croatia
HU	Hungary
IE	Ireland
IS	Iceland
IT	Italy
LU	Luxemburg
MT	Malta
NO	Norway
NL	Netherlands
PT	Portugal
RO	Romania
RS	Serbia

SE	Sweden
SI	Slovenia
XK	Cosovo