Empowering Europe's Energy Transition: the Vital Role of a Geological Service for Europe in Science-Based Policy Support

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Summary

The Geological Service for Europe (GSEU - https://www.geologicalservice.eu) is an EU funded project dedicated to providing comprehensive geoscientific data, knowledge, and expertise to support sustainable development and decision-making processes across Europe. As a trusted source, the sustainable organization that we aim to create at the end of project (the Geological Service for Europe - GSE) will play a pivotal role in addressing various challenges related to the energy transition, environmental management, natural resource exploration, societal and policy makers' needs. With an extensive network of geoscientists, in development cutting-edge knowledge hub, and collaborative partnerships, the GSE will serve as a reliable source of geological information, facilitating informed decision-making, risk assessment, public participation, and policy development to ensure a resilient and sustainable future for Europe and its communities.

This document highlights the relevance of the Geological Service for Europe (GSEU) project in addressing key challenges and opportunities associated with the energy transition in Europe on the path toward establishing a sustainable Geological Service. Moreover, we explore the GSE's future contributions to, e.g., the sustainable development of European renewables, regulatory framework improvements, social governance of the subsurface, technical projects with public participation, financing new energy projects, and policy developments to enable the energy transition.

Introduction

The need for a Geological Service for Europe (GSE) arises from the critical importance of accurate and reliable geoscientific information in addressing the complex challenges of our evolving world. With the energy transition, environmental management, and sustainable development at the forefront, decision-makers require comprehensive geological data, expertise, and science-based advice to navigate the intricacies of these intersecting domains that all rely on sustainable management and use of the Earth's subsurface.

A future GSE will fulfil this need by bridging the gap between the geoscience community and policymakers, providing them with necessary tools and insights to make informed decisions about the subsurface. By offering a centralized platform for geoscientific knowledge and fostering collaboration among stakeholders, the envisioned GSE will play a vital role in enabling evidence-based policies, mitigating risks, promoting public participation, and ensuring the long-term sustainability of Europe's socio-economic and environmental landscape.

As a means to establishing a GSE, the GSEU project is developing both the data, the data infrastructure, and the expert network base, as well as developing the organisational and governance framework and stakeholder support necessary to establish a future sustainable GSE.

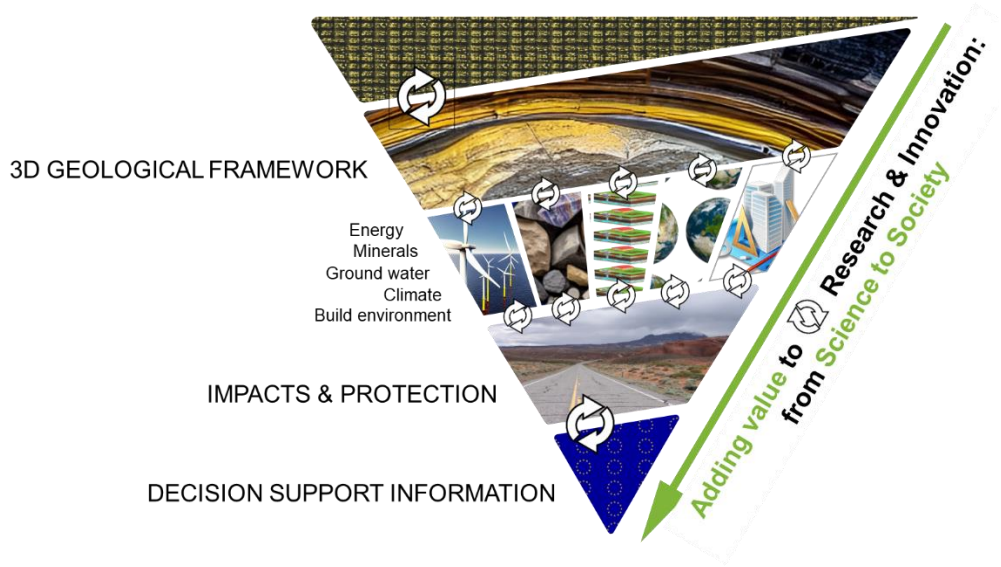

Figure 1 *From a 3D Geological Framework to Decision Support Information: adding value to Research & Innovation from Science to Society.*

Background

The activities of the GSEU project align with the European Commission's vision for a climate-neutral economy and a healthier planet. They recognize the significance of the subsurface as a source of vital resources and opportunities for decarbonization. The need for a European perspective in geological services stems from the transnational and continent-wide nature of geological features relevant to society and the economy. This requires collaboration, standardization, and a shared vision to address large-scale challenges such as groundwater management, soil health, hazard risk, renewable energy production, carbon capture and storage, supply of critical raw materials, and more. The GSEU project aims to leverage the expertise of existing National Geological Surveys and build on best practices to establish joint services that support the energy and climate transitions.

The challenge lies in creating a permanent Geological Service for Europe, moving beyond one-off projects and digital platforms to a comprehensive hub of data, information, expert reports, and advisory services. Building on previous initiatives like the GeoEra program and the development of the European

Geological Data Infrastructure (EGDI - https://www.europe-geology.eu/), the GSEU project aims to involve national stakeholders, gain support, and obtain a mandate for a long-term European Service.

Project's Objectives and Structure

The specific objectives of GSEU project are:

1. To develop pan-European harmonised data and information services in Europe with a focus on:

- Critical raw materials
- Geothermal energy resources and subsurface storage capacities for sustainable energy carriers and CO_2 sequestration
- Groundwater dynamics and quality
- Geological and climate change information for coastal vulnerability assessment and
- Geological baseline information

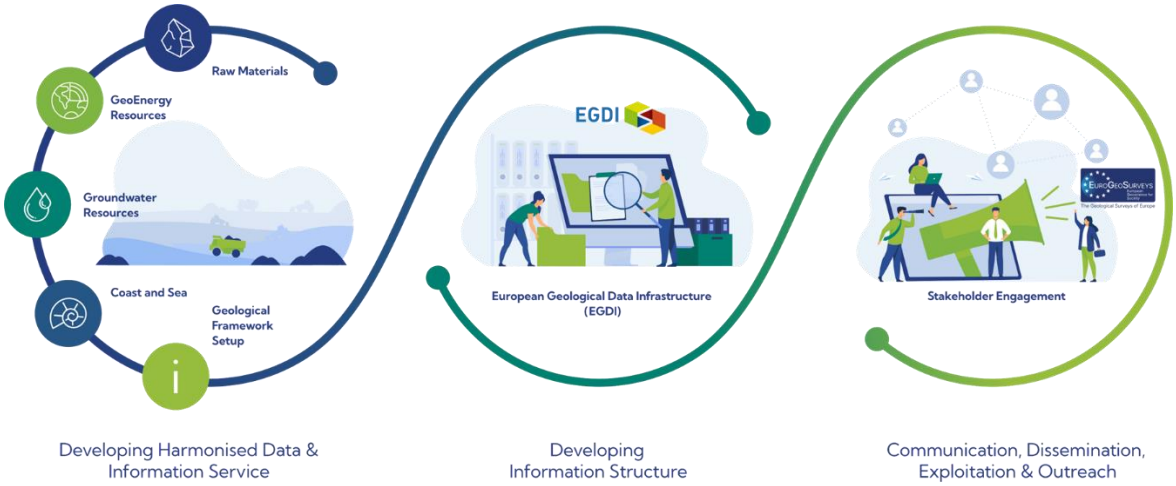

Figure 2 *The 3 pillars of the GSEU: Developing Harmonized Data & Information Service, Developing Information Structure, Communication, Dissemination, Exploitation & Outreach.*

2. To establish the European Centre of Excellence on Sustainable Resource Management to promote the deployment of the United Nations Framework Classification for Resources (UNFC) and the United Nations Resource Management System (UNRMS)
3. To develop the geological data infrastructure - building on the existing EGDI - to provide permanent access to and dissemination of the data and information services developed under the project and beyond, targeting a wide range of stakeholders, with the specific aim of enabling further innovation and strengthening the market uptake of innovative solutions
4. To provide a common European Geological Knowledge Base Platform as the single open access portal to the project results and to the underlying data and information collections and infrastructures of partners at national and regional level
5. To further strengthen the network of national and regional geological survey organisations to provide geological knowledge and services in a sustainable manner.

The Geological Service for Europe organization will address:

1. The need for up-to-date, multi-thematic, harmonised data, information, and knowledge to inform Green Deal-related policy development and implementation that requires an understanding of the nature, composition, and processes operating on and in the European subsurface (e.g., mineral resources, energy, water).
2. The need for rapid timely expert advice on a range of policy matters related to the Green Deal including, e.g., critical raw materials, subsurface storage (carbon dioxide, hydrogen,

compressed air, heat, gas, nuclear waste), renewable energy (geothermal), groundwater quality and quantity, hazards (landslides, flooding, coastal erosion), offshore infrastructure (wind farms).

Specifically, the GSE will provide data, information, knowledge, and advice that can enable more effective implementation of:

- The Water Framework Directive
- The Groundwater Directive
- The Critical Raw Materials Regulation
- The Net Zero Industry Regulation

The future GSE: interactions between energy transition uses, the society and the environment

Current economy and market dynamics in European Renewables

The GSE will play a vital role in providing geoscientific data and analyses that inform decision-making processes related to the development, deployment, and optimization of renewable energy technologies. By assessing the geological characteristics of potential sites for renewable projects and conducting resource assessments, the GSE will aid in identifying economically viable areas for renewable energy generation.

Regulatory framework: barriers and improvements

The GSE's geological knowledge will assist policymakers and regulators in addressing barriers to the energy transition. By considering geological factors, such as land use constraints, geological storage options, and environmental impact assessments, the GSE will inform the development of effective regulations and policies that promote renewable energy deployment while ensuring environmental sustainability.

Social Governance of the subsurface in an evolving world

The GSE's involvement in social governance of the subsurface will foster transparency and public engagement in decision-making processes related to energy transition projects. By providing accessible geological information, and facilitating dialogue between stakeholders, the GSE will promote inclusive and informed decision-making regarding subsurface activities.

Just Energy Transition and the Green New Deal

The GSE's comprehensive understanding of the geosciences contributes to achieving a just energy transition and goals outlined in the Green Deal. By conducting impact assessments, identifying equitable renewable energy deployment opportunities, and considering the socio-economic implications of energy transitions, the GSE will support the development of policies and strategies that prioritize social equity and environmental justice.

Technical projects with focus on public participation

The GSE will play a crucial role in technical projects related to renewable energy infrastructure by advising the policy makers about which type of projects will have a higher social economic impact. By incorporating as citizen science initiatives, stakeholder consultations, and collaborative mapping exercises, the GSE will foster quality, transparency, trust, and public acceptance of renewable energy projects.

Policy developments to enable the energy transition: lessons from the geosciences

The GSE's accumulated knowledge and experience in the geosciences will offer valuable lessons for policy developments to enable the energy transition. By analysing past and ongoing geological studies, the GSE will inform policymakers and researchers about successful strategies, best practices, and innovative approaches to accelerate the adoption of renewable energy technologies.

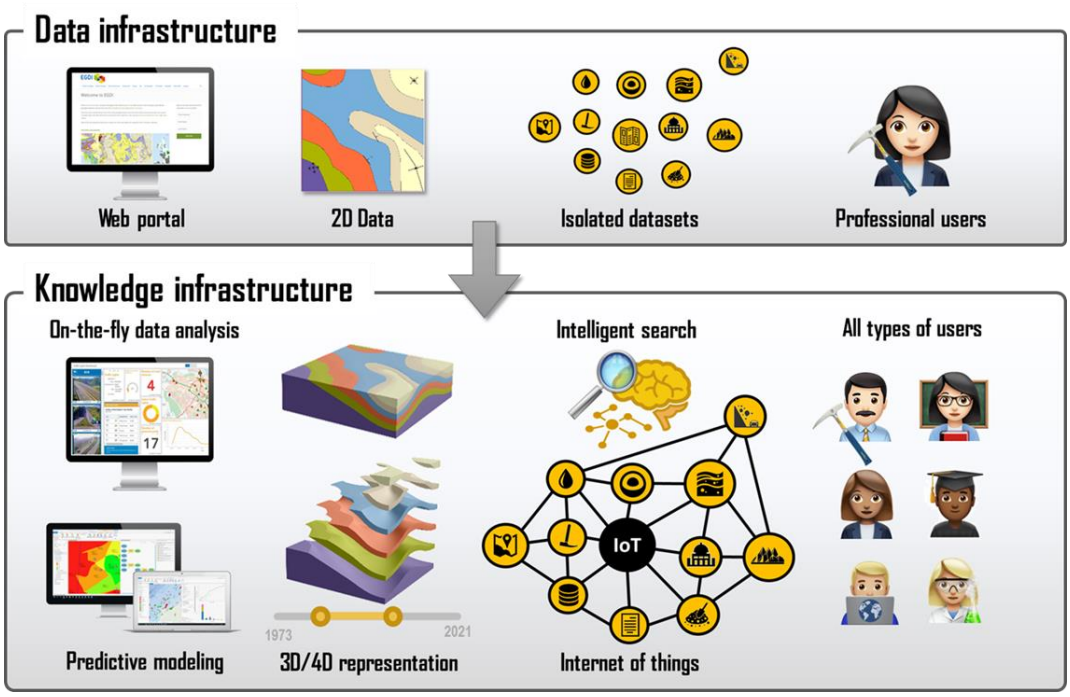

Figure 3 *Evolution of the EGDI platform: from a Data Infrastructure to a complete Knowledge Infrastructure. Serving a wider range of stakeholders and integrating 3 and 4D geomodels.*

Conclusions

In conclusion, the Geological Service for Europe will play a vital role in facilitating the energy transition in Europe. Through its geological expertise, data, and collaborative initiatives, the Geological Service for Europe will contribute to addressing responsible management and prioritized use of the subsurface and informed decision-making, public participation, and policy developments that promote a sustainable and just energy future.

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