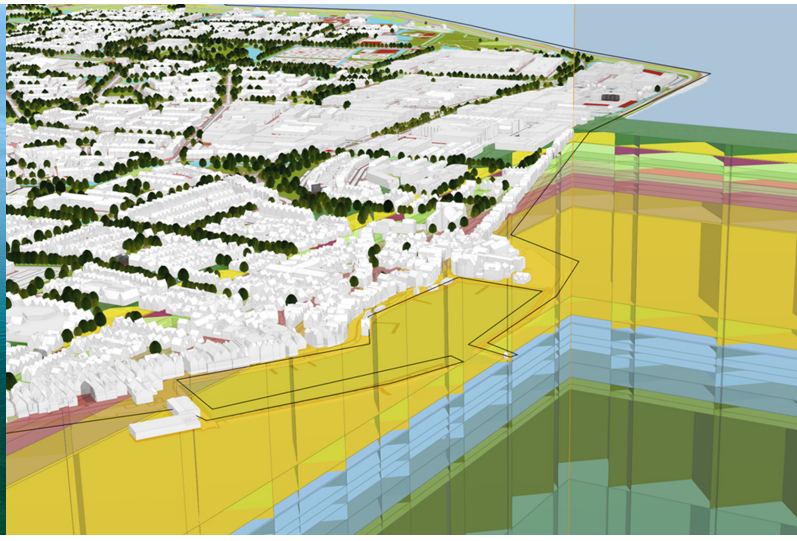
June 2026

EuroGeoSurveys
European Geoscience for Society
The Geological Surveys of Europe

POSITION PAPER

Subsurface Geospatial Planning for European Resilience and Strategic Autonomy

EuroGeoSurveys is a non-profit organisation representing the European national geological survey organisations, composing a 10,000+ workforce collaborating through scientific expert groups, task forces, and EU-funded projects. Together, we are laying the foundation for a permanent Geological Service for Europe. This service will provide pan-European public geological data and strong geoscientific expertise to support science-based policy and action. It will help accelerate the large-scale deployment of solutions to key European challenges, including sustainable geo-energy, critical raw materials, and groundwater and water resources for both society and nature.



Key messages

- The **subsurface is a key property for human activities** and vital for achieving important European policy goals, connected to different topics such as (geo-) energy and CO_2 storage, groundwater, and raw materials exploitation.
- A comprehensive approach is required to **integrate subsurface-related European policies and regulations in spatial planning**. Sustainable, integrated management of the geological subsurface will contribute to Europe's strategic autonomy and resilience.
- Improved management and use of the subsurface at different planning levels across Europe can be supported by FAIR **data and information**, applied **geoscience research**, and **expert advice**, provided by a continental-scale Geological Service for Europe.

Call for subsurface integrated spatial planning in Europe

Europe faces **growing competition for subsurface resources** (raw materials, energy, water, soil) driven by ambitions for strategic autonomy, the green transition and urbanisation. Strategic policies connected to economic security, safety, and the European Clean Industrial Deal aim for net-zero emissions by 2050, resilient supply of critical raw materials, and high standards for water and hazard management. Regulatory examples are the Critical Raw Materials Act, the Net Zero Industry Act, and the European Water Resilience Strategy.

Achieving these ambitions will benefit from **integrated surface and subsurface management within land-use planning**. Beyond traditional uses, the subsurface is key for decarbonisation through CO_2 storage, hydrogen and energy storage, geothermal systems, groundwater management, and raw materials exploitation. It is already urgent in urbanised areas where multiple human activities are competing for space within much smaller areas. This involves, e.g., underground secondary infrastructures such as tunnels, parking, stormwater tanks, district heating (and cooling) networks and facilities. At larger scale the combined surface and subsurface space must also support measures mitigating climate impacts (floods, droughts, heat) and geo-hazards. Integrated spatial planning therefore requires robust knowledge of geological and hydrogeological conditions.

However, most European countries lack consistent, integrated regulations for subsurface use. Existing rules are often sector-specific (mining, geothermal, groundwater) and rarely address competing priorities or interactions between surface and subsurface uses.

To accelerate sustainable transitions Europe must shift from fragmented, “first-come-first-served” approaches to holistic, cross-sector spatial planning that integrates subsurface and surface functions, embedding subsurface considerations into planning processes. Cross-border coordination is essential for energy storage, CO_2 storage, and resource extraction.

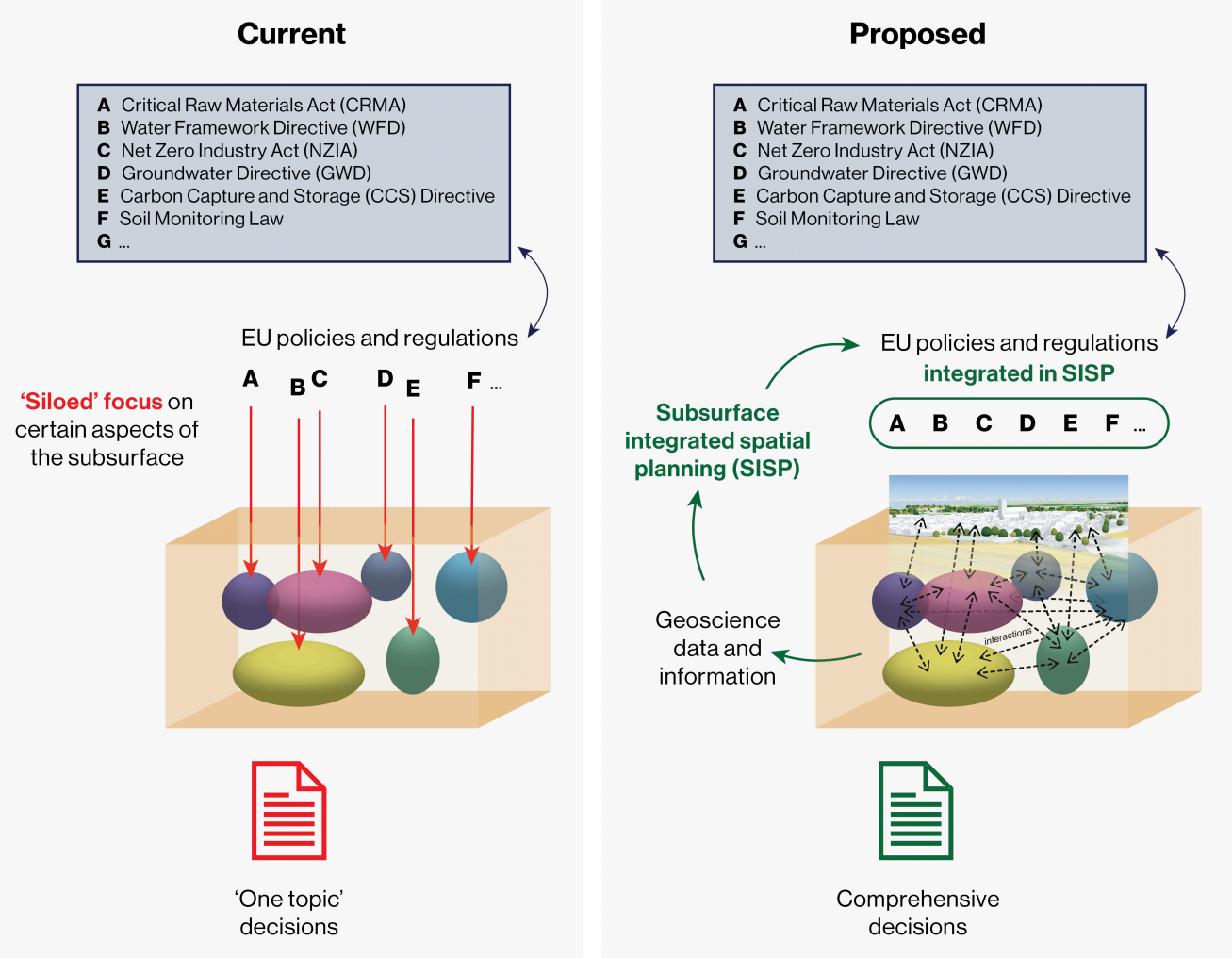
Integrated planning also underpins **responsible resource extraction**. Strategic approaches guided by several EU directives and strategies must balance access to raw materials, groundwater, and energy storage with environmental integrity and community needs. Effective planning combines geoscientific knowledge with collaboration among local authorities, industry, agriculture, and policy makers, ensuring long-term sustainability while supporting Europe’s green and secure future.

Current EU legislation and policies, impacting the subsurface

EU Legislation / policy	Goal
Critical Raw Materials Act (CRMA)	Enhance self-sufficiency of mineral raw materials in the EU
Water Framework Directive (WFD)	Prevent and reduce pollution, promote sustainable water use, protect and improve the aquatic environment and mitigate the effects of floods and droughts
Groundwater Directive (GWD)	Protect groundwater against pollution and deterioration
European Water Resilience Strategy (EWRS)	Ensure secure, clean, and affordable freshwater supply
Urban Wastewater Treatment Directive	Manage wastewater and adapt to climate change, supporting also nature-based solutions
Net Zero Industry Act (NZIA)	Achieve carbon neutrality by 2045
Soil Monitoring Law	Specify required conditions for healthy soils through evaluation and monitoring of soils
Nature Restoration Law	Preserve and increase biodiversity and landscape resilience
INSPIRE	Provide standardised geospatial information for sustainable development, public administration, public safety, and environmental decision-making.
Marine Spatial Planning Directive	Promote the sustainable growth of the EU's Blue Economy, development of marine areas and use of marine resources
Carbon Capture and Storage (CCS) Directive	Provide a regulatory framework for CCS, and support to competent authorities and storage site operators so that CO_2 can be safely stored underground.
Renewable Energy Directive (RED)	Speed up the EU's clean energy transition by increasing the share of renewables in its energy mix (geothermal energy)

Recommendations

Integrating subsurface data and knowledge in spatial planning practice has benefits at different governance levels and supports a more comprehensive implementation of European policies at continental scale.



To develop policy and practice towards subsurface integrated spatial planning we recommend the following courses of action (illustrated by related example cases):

1. Develop EU policy to advance subsurface geospatial planning
2. Invest in geoscientific ('subsurface') research
3. Develop capacity for expert and policy advice
4. Sustainable provision of geoscientific data and information

1. Develop EU policy to advance subsurface geospatial planning

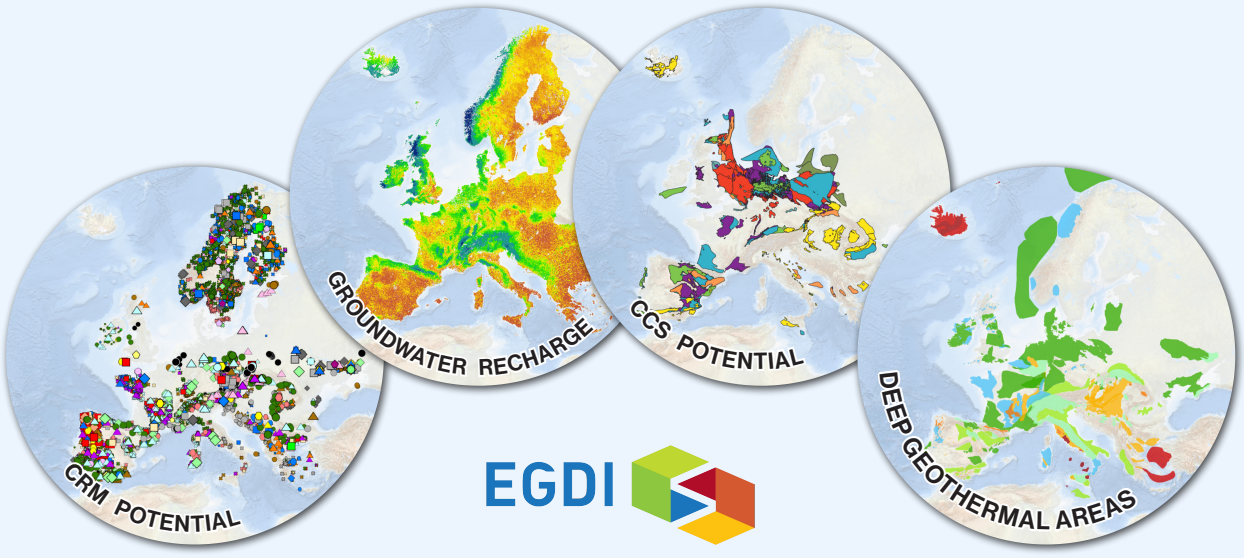
To advance the integration of multiple subsurface-related EU ambitions in geospatial planning and decision-making we recommend three main courses of action. The first is to develop frameworks at EU level that stimulate interaction and consultation between different departments dealing with topics that interfere in the subsurface. Next, develop 'holistic' policy strategies or frameworks at EU level regarding geospatial decision-making about (sub-)surface land use in case of competing or interfering activities relevant to EU policy. Subsequently, raise awareness about subsurface-related EU regulations in planning practices at national, regional, and local levels.

Pan-European information to support European policy-making for (competing) subsurface resources

One of the main services of the future Geological Service for Europe is the European Geological Data Infrastructure (EGDI). This platform provides and develops:

- Pan-European overviews of different (potential) resources in the subsurface, e.g. concerning Critical Raw Materials, Groundwater, CCS potentials, and geothermal capacities
- Data and information for analysis of potentials and interferences connected to different subsurface and surface uses
- A European network of experts

This information can support the development of European policy frameworks to set priorities concerning strategic resources and to identify risks and impacts of (combined) uses of the subsurface and surface.



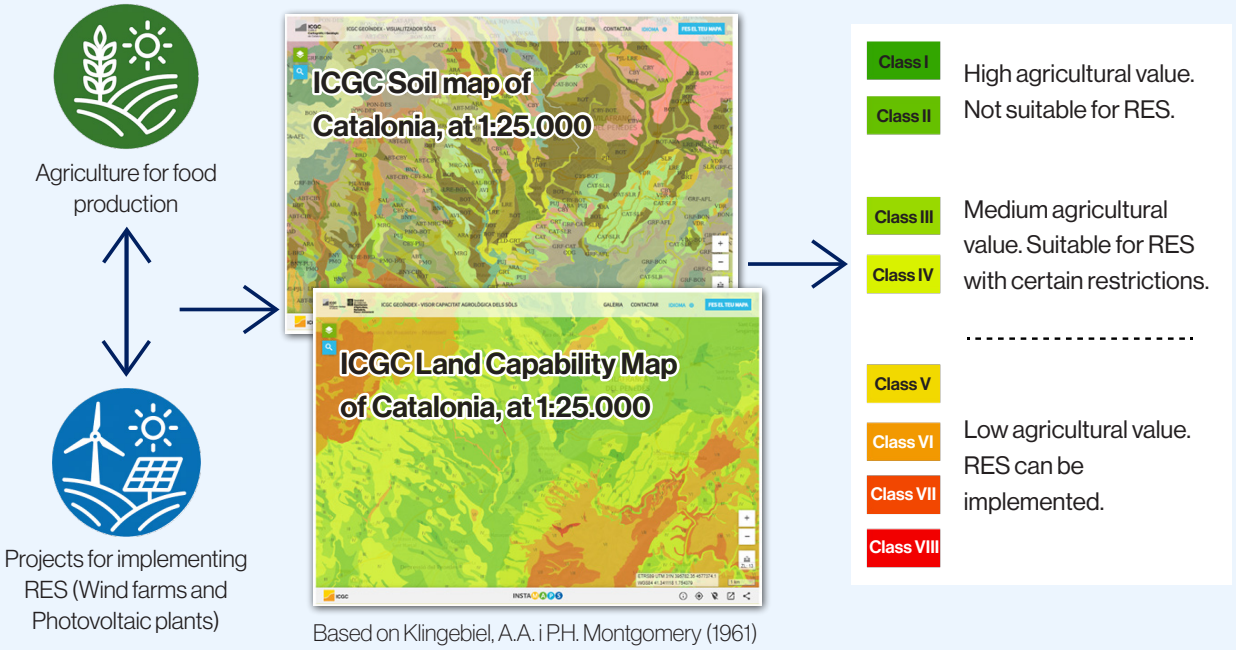
Examples of maps available through the EGDI Map Viewer.

2. Invest in geoscientific ('subsurface') research

New practices of 'subsurface integrated spatial planning' at different governance and scale levels will enable 'preparedness by design', supporting improved and more comprehensive implementation of subsurface-related European policies. A better understanding of the often complex interferences and impacts of subsurface and surface land use requires continuous interdisciplinary and applied geoscientific research. We propose to deliver this research through a co-funded Partnership under the Geological Service for Europe. This approach will deliver a sustained, up-to-date, integrated understanding of the subsurface, enabling holistic policy and decision-making for multiple strategic priorities simultaneously across e.g., sustainable clean energy, critical raw material supply, water supply, climate change and geohazards mitigation, urban resilience, and environmental protection.

Land Use Conflicts: Agriculture vs. Renewable Energy in Catalonia

Since 2019, conflicts between preserving agricultural land and developing renewable energy (wind farms and photovoltaic plants) have been managed using the Land Capability Map of Catalonia, at 1:25.000, derived from the Cartographic and Geological Institute of Catalonia (ICGC) Soil map of Catalonia, also at 1:25.000. The Agriculture Capability Soil Map of Catalonia classifies soils according to their suitability for development of RES (Renewable Energy Systems): Types I and II are unsuitable, Types III and IV may be used under certain conditions, and Types V-VIII are suitable. This classification evaluates soil according to physical characteristics and environmental context, enabling a balanced approach between energy planning and agricultural land protection.



Based on Klingebiel, A.A. i P.H. Montgomery (1961)

Source: https://www.icgc.cat/ca/Eines-i-visors/Visors/Visualitzadors-Geoindex

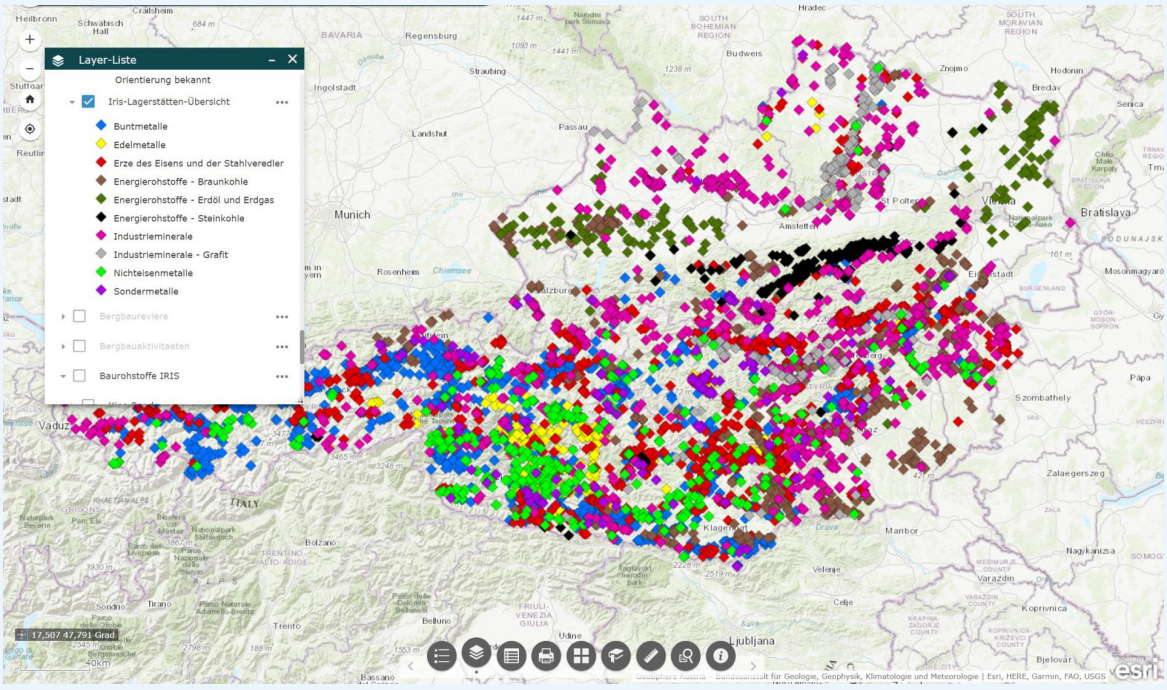
3. Develop capacity for expert and policy advice

EU wide, comprehensive implementation of 'subsurface' EU policies and directives, supported by subsurface integrated spatial planning, requires science-informed policy and decision-making across governance levels.

At European level, advice, decision frameworks, and wider strategy development are needed to support implementation of 'subsurface' policies at national, regional, and local levels, aligned with European goals and ambitions. This requires a network of experts to provide policy support and translate 'subsurface' knowledge into guidance on policy challenges, opportunities, and sustainable prioritisations. We propose to deliver this expert geoscience advisory support through the Geological Service for Europe.

The Austrian Mineral Resources Plan

The Austrian Mineral Resources Plan (AMRP) is a national policy tool that safeguards mineral deposits – such as aggregates and construction materials – by integrating them into land-use planning. It identifies low-conflict, minable areas and balances them with other land-use priorities such as nature protection, urban development, and water management. Because mineral policy is set nationally, while spatial planning occurs at provincial and municipal levels, AMRP supports both horizontal and vertical coordination across institutions to enable coherent minerals and land-use planning. Read more about this good practice case.



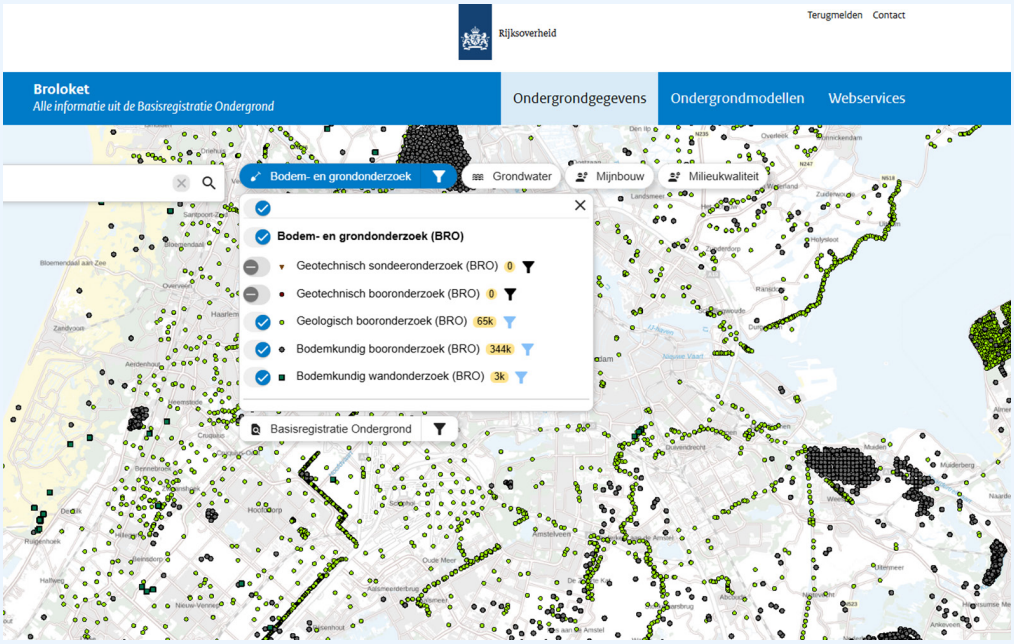
Source: https://www.geosphere.at/en/topics/natural-resources/mineral-resources

4. Sustainable provision of geoscientific data and information

Professional research and advice aimed at wider implementation of subsurface integrated spatial planning must be based on up-to-date, accessible, standardised, and harmonised geoscientific data. This requires a sustainable data infrastructure at European level, connected to data spaces, but also connecting to national, regional and local datasets. Progress towards sustainable, pan-European, accessible, standardised, and harmonised datasets requires continuous development. Subsurface integrated spatial planning requires specific development of geoscientific data and models (including 3D and 4D) across different scale levels. Another important topic is dealing with the trend of data becoming less accessible, connected to, e.g., critical infrastructure.

Key Register for the Subsurface (BRO) in the Netherlands (and similar initiatives in Norway and Belgium)

- National database for subsurface data and information to support policy, planning, and design regarding multiple topics: fresh water supply, climate adaptation, urban and infrastructure development, water safety, the energy transition
- All Dutch public boards are obliged to use this registry when making decisions that relate to the subsurface.
- This key register is legally governed by national law; governance can be compared to national person, car or address registries.
- As part of the future Geological Service for Europe, the national data could be made accessible, as part of FAIR data at European level



Source: https://www.broloket.nl/ondergrondgegevens

The foundational data infrastructure already exists as the European Geological Data Infrastructure (EGDI), a digital platform for delivering subsurface data relevant to policy, including raw materials, geothermal energy, groundwater, earth observation and geohazards, urban development, coastal zone management, offshore, infrastructure development, carbon and hydrogen storage potential, soil chemistry, and the geological maps and models underpinning all these areas.

To maintain and enhance this platform for pan-European policy advice, including improved data content and functionality, sustainable investment is needed beyond current funding ending in 2027. This will build on decades of major investments by geological surveys and partners, including national funding, GeoERA, and GSEU projects, amongst others. Current datastores and infrastructure represent significant value with strong potential to support spatial development, while further pan-European and cross-border developments will deliver benefits that significantly exceed required investments.

The example cases highlight how **subsurface integrated spatial planning** – strengthened by reliable data, targeted research, and expert advice provided through a Geological Service for Europe – can directly support more effective, sustainable, and coherent implementation of EU subsurface policies.

By offering a structured, evidence based approach, the **Geological Service for Europe** equips policy makers with the insights needed to reduce risks, optimise land use decisions, and ensure long term resilience across sectors that depend on the responsible use of Europe's underground space.

EuroGeoSurveys European Geoscience for Society
The Geological Surveys of Europe

GSEU GEOLOGICAL SERVICE FOR EUROPE

Funded by the European Union

EGDI

Note: The Geological Survey of Sweden has not contributed to, nor approved this position paper.