



GSEU

GEOLOGICAL SERVICE | FOR EUROPE

**Klaus Hinsby (GEUS), Dept.
Chair of the Water Resources
Expert Group of
EuroGeoSurveys**

**How to access groundwater and geoscience data in the
European Geological Data Infrastructure, EGDI, to support
groundwater quantity and quality risk and status assessments**

<https://www.europe-geology.eu/>



www.geologicalservice.eu

EU GREEN WEEK 27.8.2024



What is EGDI? Some background...

- European Geological Data Infrastructure
- An initiative by EuroGeoSurveys:
 - Original purpose ~2011: To save the results of the many European project results that “disappeared”.
 - EGDI Scope project 2012 - 2014: How to establish an EGDI and how to operate it?
 - Version 1 of EGDI established in 2016 by EGS members (Spatial Information Expert Group).
 - Funding of basic operations by EuroGeoSurveys.
- Chosen as the data platform for the GeoERA programme and it's 14 geoscientific projects (2018 – 2021).
- Chosen as the data platform for the GSEU project (2022 – 2027).
- Recognised as a fundamental element of a future Geological Service for Europe.



The European Geological Data Infrastructure (EGDI)

TOOLS FOR SEARCHING AND SHOWING DATA



SCIENTIFIC THEMES



Data search

Language: English (en)

You are here: Home / Tools for searching and showing data / Data Search

Allows users to discover and access available datasets, view their metadata and select, display and download subsets of elements from multiple datasets. Datasets that do not contain in their metadata or their data exactly the terms the user typed in the search can be found because semantically similar words from the Thesaurus are incorporated in the search.

Type your search text

Search

Filter

<https://www.europe-geology.eu/>



The European Geological Data Infrastructure (EGDI)

TOOLS FOR SEARCHING AND SHOWING DATA

Map Viewer Data Search Repository Vocabularies Multilingual Keyword Thesaurus Metadata Catalog Map Services

Basic Geology Marine Geology Mineral Resources GeoEnergy Water Resources Geochemistry Earth Observation and Geohazards

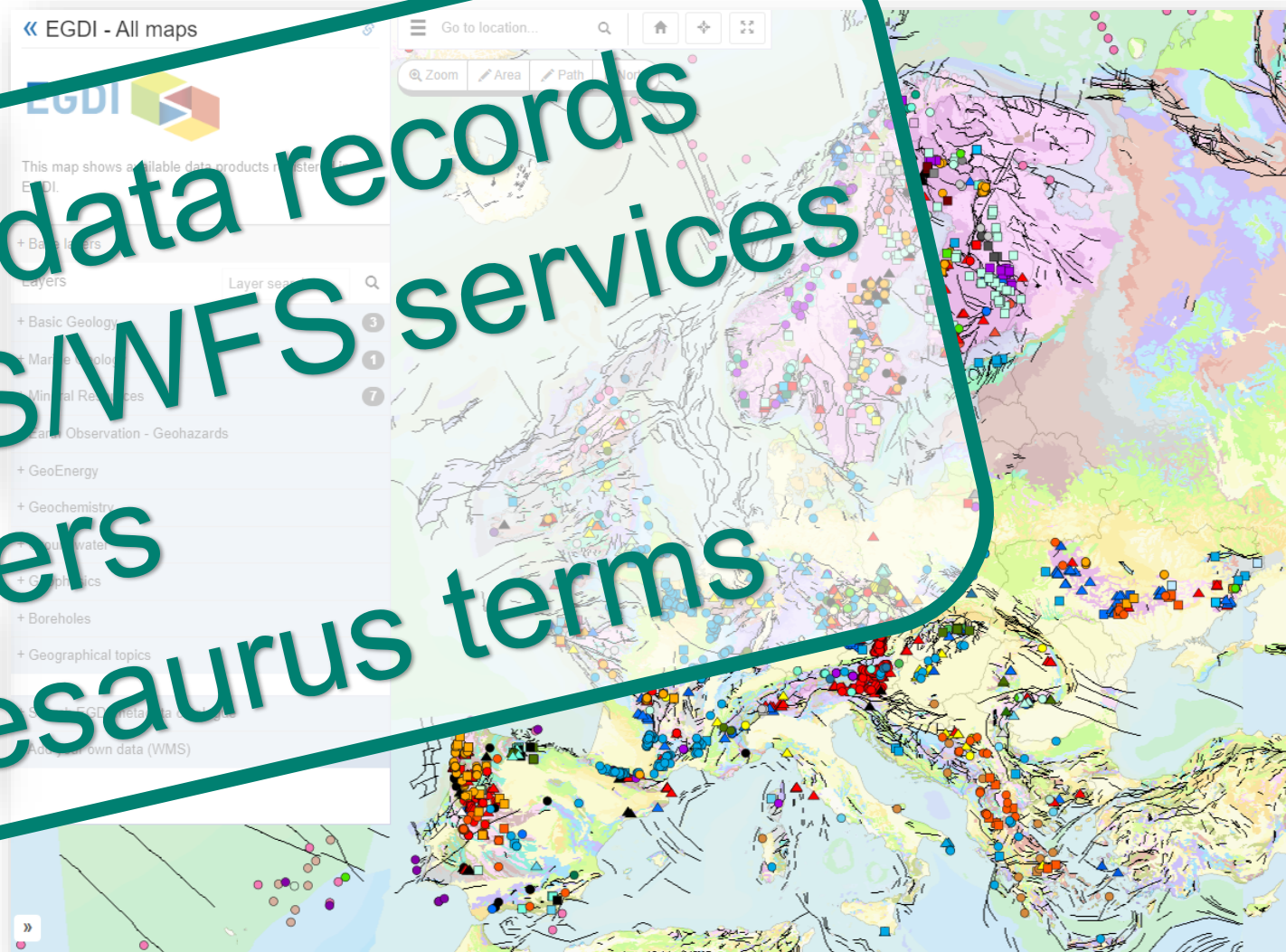
Data search

You are here: Home / Tools for searching and showing data / Data search

Allows users to discover and access available datasets, view their metadata and geology display and download subsets of elements from multiple datasets. Datasets that do not contain in their metadata or their data exactly the terms the user typed in the search can be found because semantically similar terms and synonyms are incorporated in the search.

Type your search term Search Filter

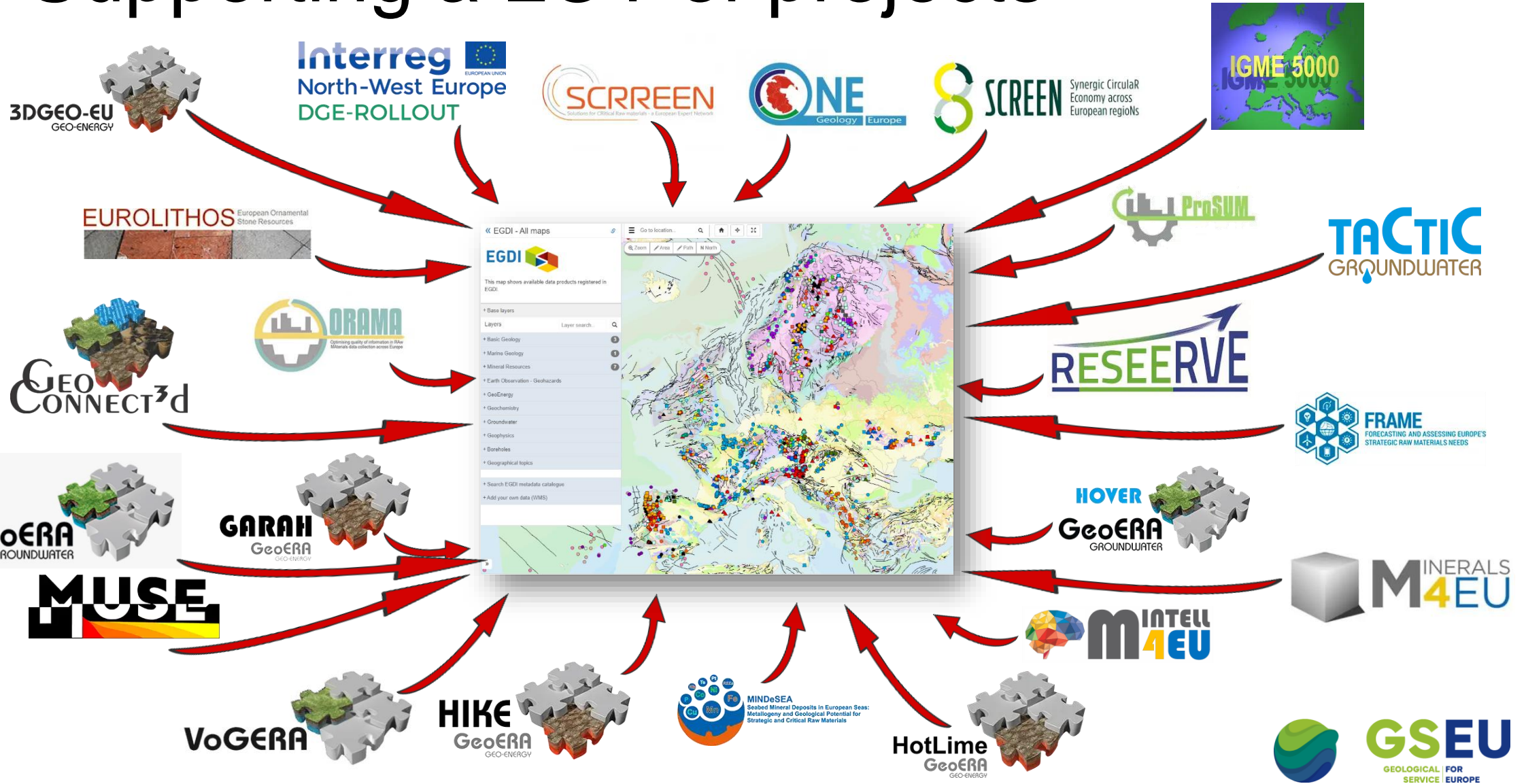
5445 Metadata records
883 WMS/WFS services
1038 Layers
5157 Thesaurus terms



<https://www.europe-geology.eu/>



Supporting a LOT of projects

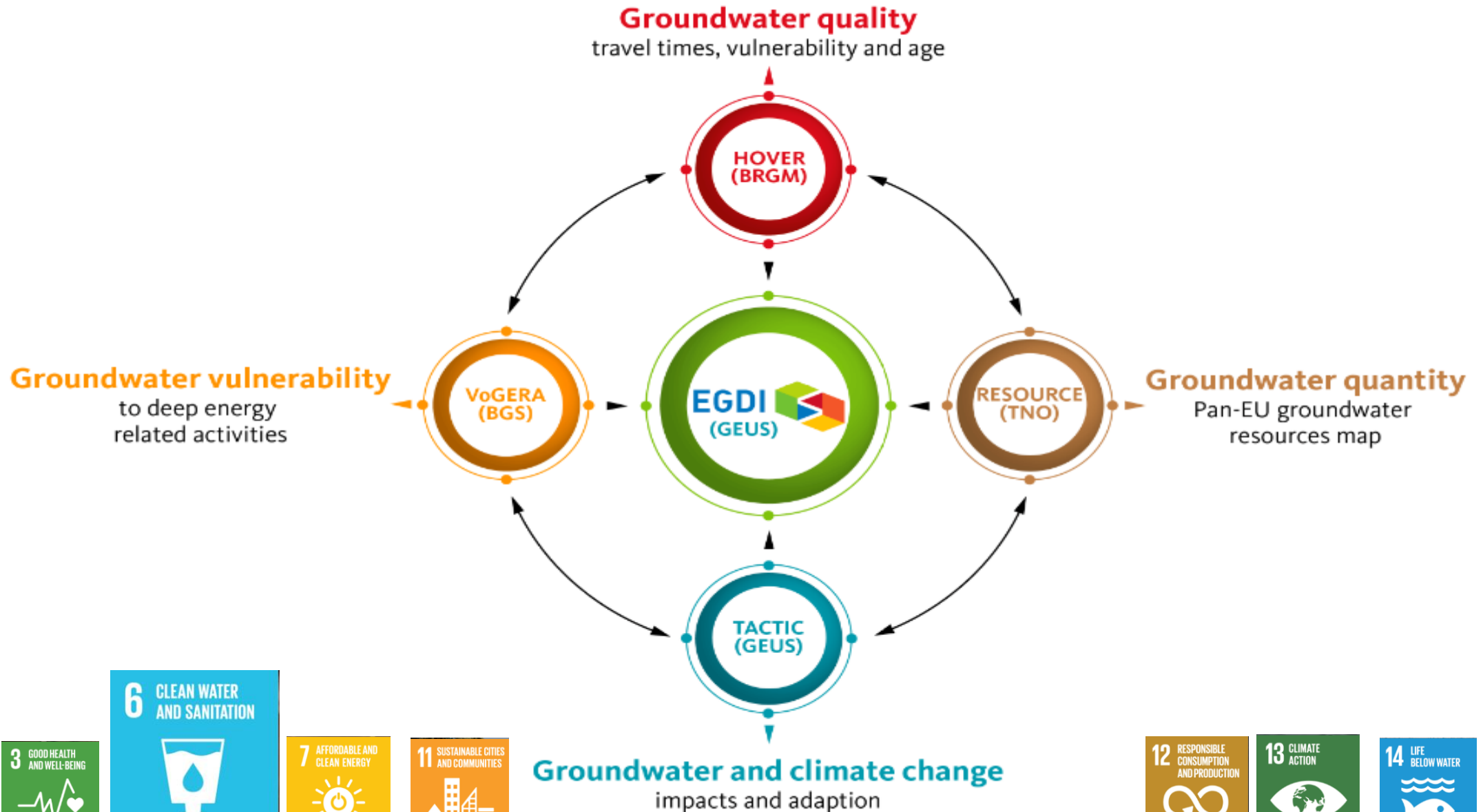




Connecting to the “surrounding world”



The four GeoERA groundwater projects and their main contributions to EGDl:



2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



6 CLEAN WATER AND SANITATION



7 AFFORDABLE AND CLEAN ENERGY



11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND





Thematic entries to geology and groundwater data via the EGDI map viewer <https://www.europe-geology.eu/>

EGDI

This map shows available data products registered in EGDI.

- + Base layers
- Layers
- + Basic Geology
- + Marine Geology
- + Mineral Resources
- + Earth Observation - Geohazards
- + GeoEnergy
- + Geochemistry
- + Groundwater **1**
- + Geophysics
- + Boreholes
- + Geographical topics

- + Geochemistry
- Groundwater **1**
- + Quantity
- + Quality **1**
- + Drinking Water and Health
- + Transboundary Aquifers
- + Climate Change
- + Competing uses
- + Ecosystems and biodiversity
- + Hydrogeology and geological features



Examples of groundwater quantity and quality data accessible via thematic data entries in EGDI (1)

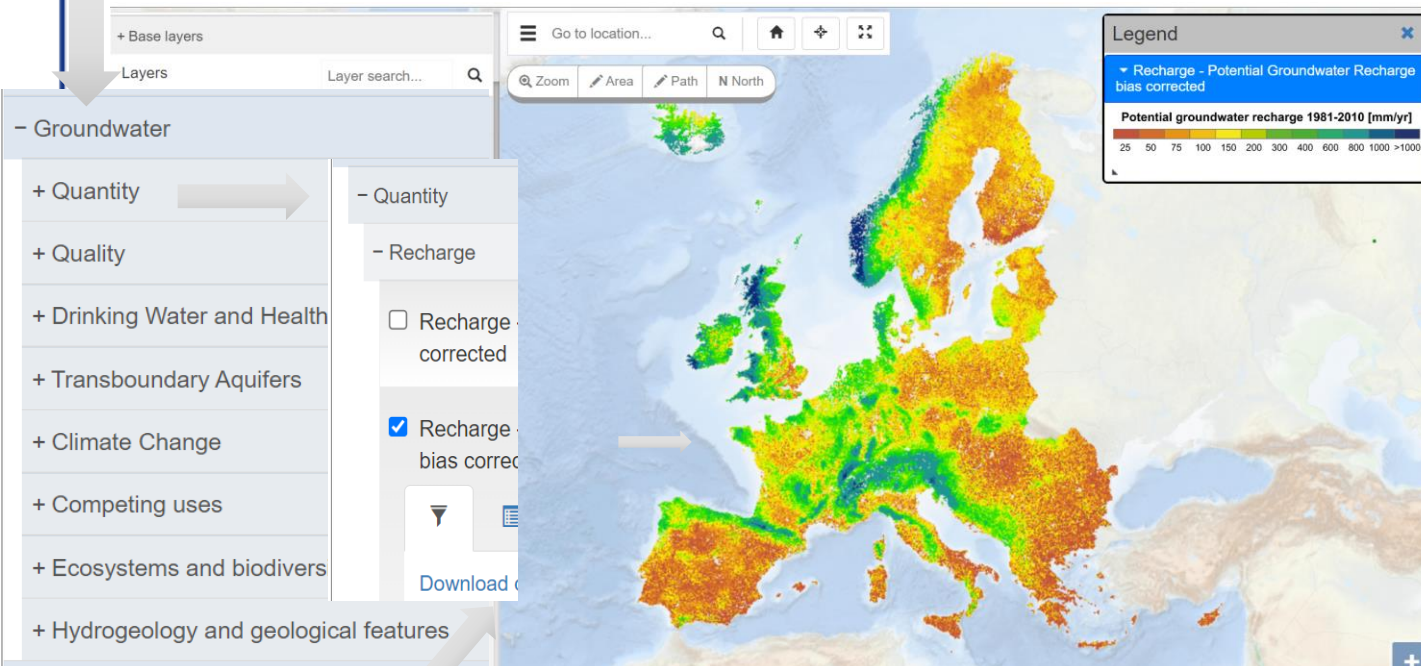
Groundwater quantity & climate change:

- Pan European map of average potential average groundwater recharge 1981 - 2010
- Near real-time water table measurements and near future projections based on these
- European groundwater resources maps (volume, depth, aquifer types)



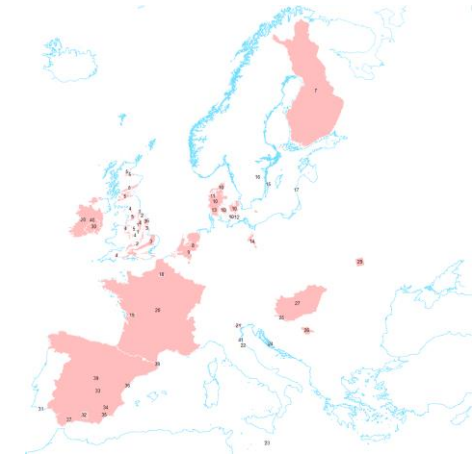
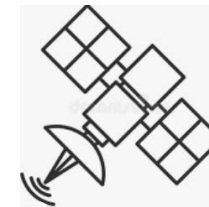
Pan-European potential groundwater recharge map 1981-2010*

Thematic entries for groundwater



Produced from local and national GSO supported models and data

Extended to European scale by the use of satellite data and machine learning



Data download

Martinsen et al. (2022). *Science of The Total Environment*, 822, 153464.
<https://doi.org/10.1016/j.scitotenv.2022.153464>



European map viewer for near real-time measurements of groundwater levels

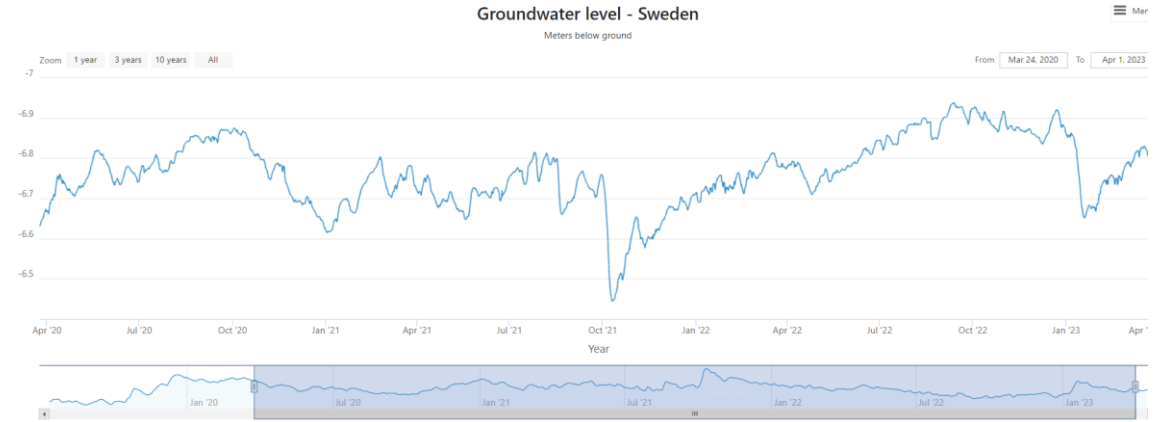
– Groundwater Resources

- Volumes and depths of prime European aquifers
- Pan-EU Groundwater Resources Map REPORTS

– Real-time water tables 1

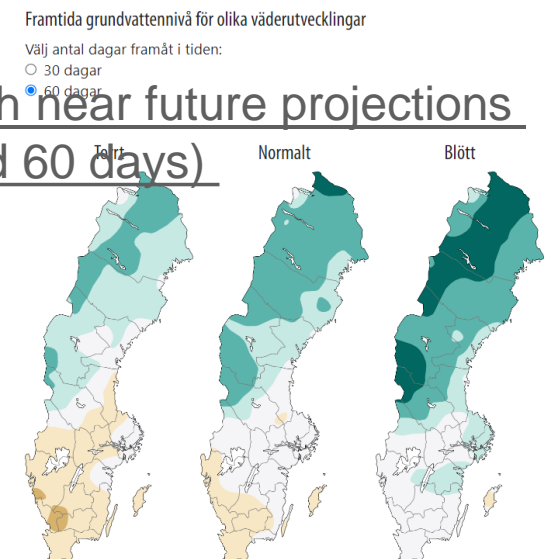
- Groundwater level

Desktop GIS



[Link to near real-time water table measurements at Swedish monitoring well operated by SGU](#)

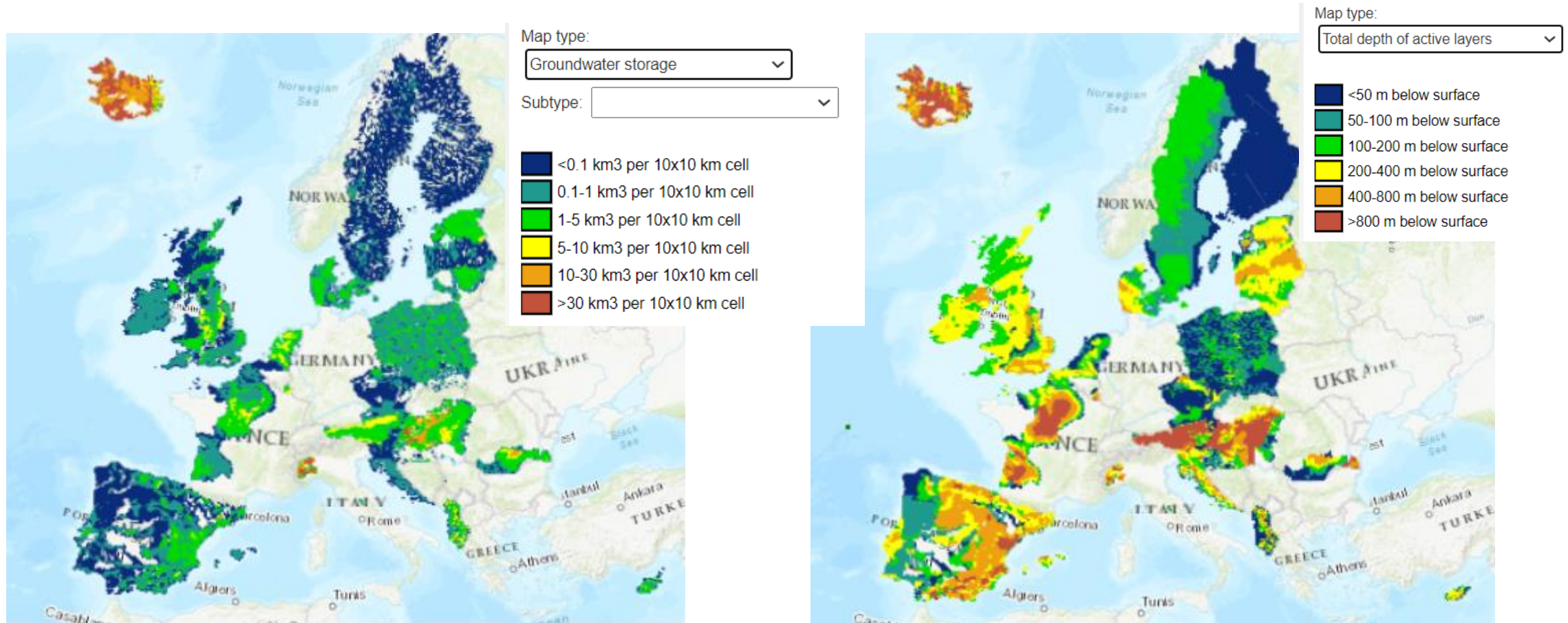
[Link to SGU map viewer with near future projections of water tables \(30 days and 60 days\)](#)



[Link to map viewer of near real-time European water table measurements – established in GeoERA based on SGU / Swedish map viewer and further extended with data from other EU member states in the GSEU](#)



Groundwater quantity – European groundwater resources maps - examples



[Link to reports: Groundwater resources map reports](#)



Examples of groundwater quantity and quality data accessible via thematic data entries in EGDI (2)

Groundwater quality & human health and status of ecosystems:

- Organic, emerging & watch list contaminants
- Inorganic contaminants, geogenic elements, natural backgrounds and human health
- Nitrate, travel times, redox conditions and vulnerability to pollution from the surface



Organic, emerging & watch list contaminants

COMMON IMPLEMENTATION STRATEGY FOR THE WATER FRAMEWORK DIRECTIVE AND THE FLOODS DIRECTIVE

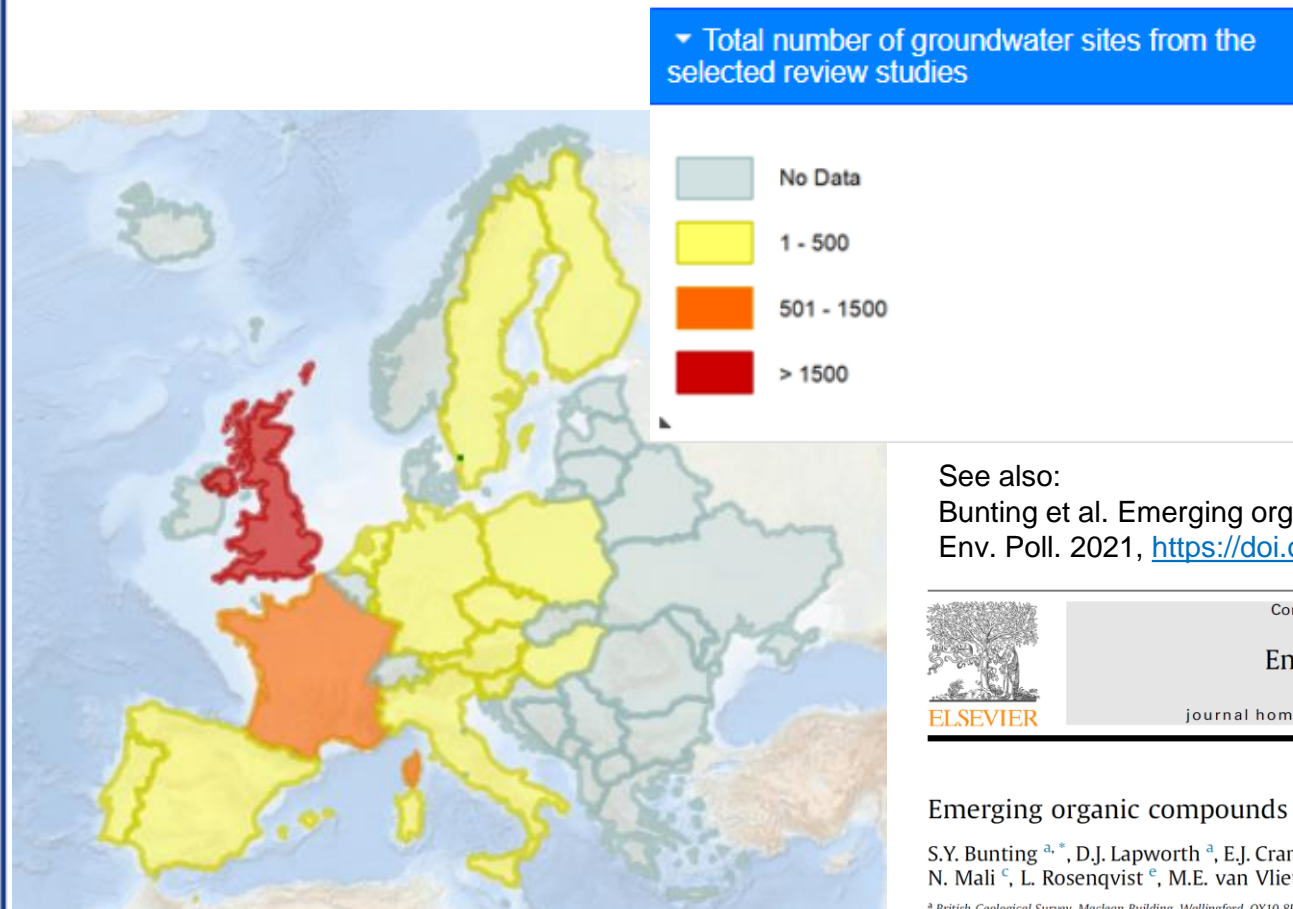


VOLUNTARY GROUNDWATER WATCH LIST CONCEPT & METHODOLOGY

based on final draft 12.3,

endorsed by CIS Working Group – Groundwater (WG GW)

[Link to CIS Working Group Groundwater \(WGGW\)](#)



See also:

Bunting et al. Emerging organic compounds in European groundwater. *Env. Poll.* 2021, <https://doi.org/10.1016/j.envpol.2020.115945>



Contents lists available at [ScienceDirect](#)

Environmental Pollution

journal homepage: www.elsevier.com/locate/envpol



Emerging organic compounds in European groundwater[☆]

S.Y. Bunting^{a,*}, D.J. Lapworth^a, E.J. Crane^a, J. Grima-Olmedo^b, A. Koroša^c, A. Kuczyńska^d, N. Mali^e, L. Rosenqvist^e, M.E. van Vliet^f, A. Togola^g, B. Lopez^g



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^b Instituto Geológico y Minero de España (IGME), Spain

^c Geological Survey of Slovenia, Department of Hydrogeology, Dimičeva ulica 14, Ljubljana, Slovenia

^d Polish Geological Institute, National Research Institute, ul. Rakowiecka 4, 00-975, Warsaw, Poland

^e Geological Survey of Sweden, Box 670, SE-751 28, Uppsala, Sweden

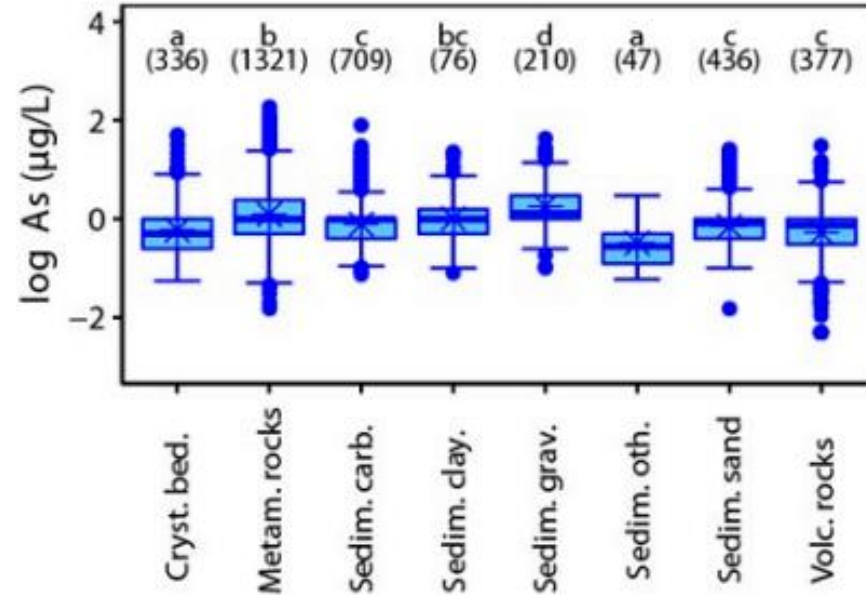
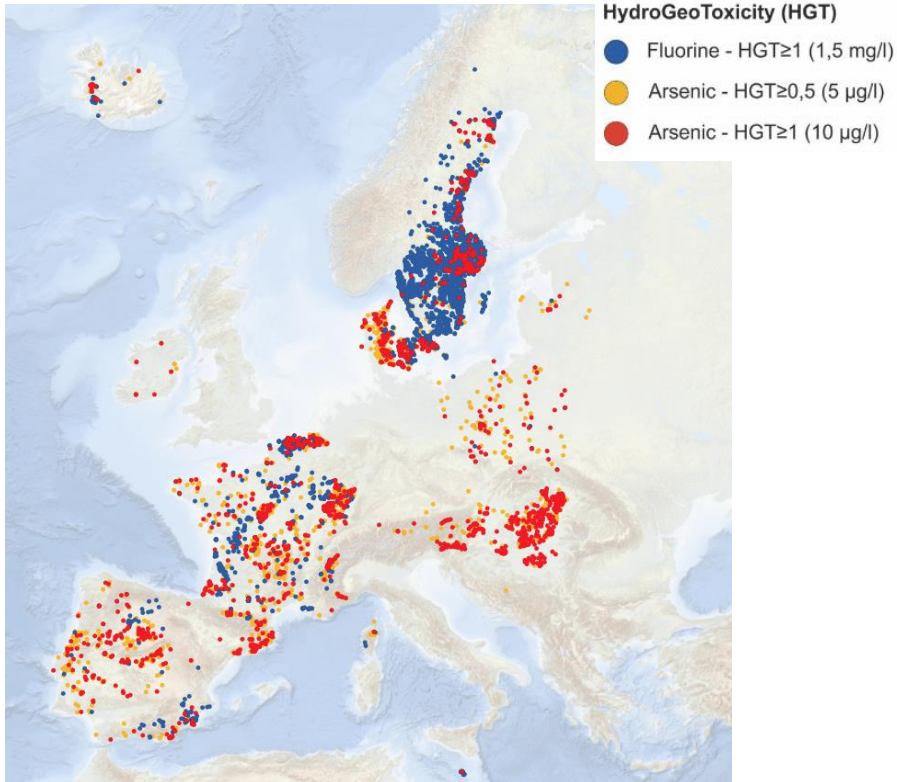
^f TNO Geological Survey of the Netherlands, Utrecht, the Netherlands

^g BRGM, (French Geological Survey) BP 6009, 45060, Orléans Cedex 2, France

[Link to datasets and reports e.g. D8.1 in EGDI](#)



Inorganic contaminants, geogenic elements, natural backgrounds and human health



Lions et al. 2021

“A Broad-Scale Method for Estimating Natural Background Levels”
Water, 2021. <https://doi.org/10.3390/w13111531>

[Link to map](#)

Giménez-Forcada, et al. 2022. “Analysis of the geological control on the spatial distribution”. Ecotoxicol. Environ. Saf. 247, 114161.
<https://doi.org/10.1016/j.ecoenv.2022.114161>

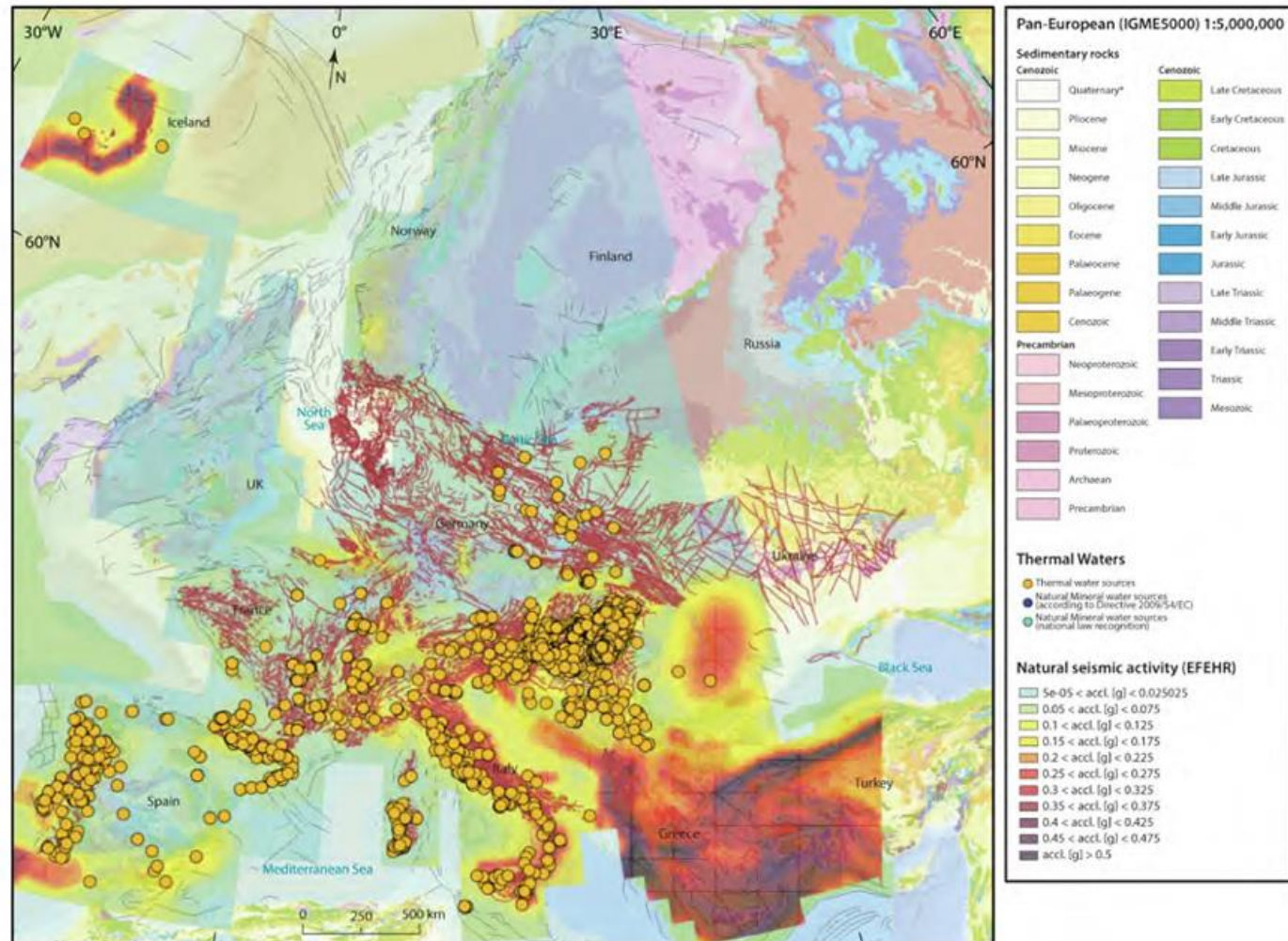


The power of geoscience map combinations and analyses for data interpretation

+ Base layers

Layers 🔍

- + Basic Geology 3
- + Marine Geology 1
- + Mineral Resources
- + Earth Observation - Geohazards 1
- + GeoEnergy
- + Geochemistry
- + Groundwater 1
- + Geophysics
- + Boreholes



COMBINING SUBSURFACE DATA IN EGD

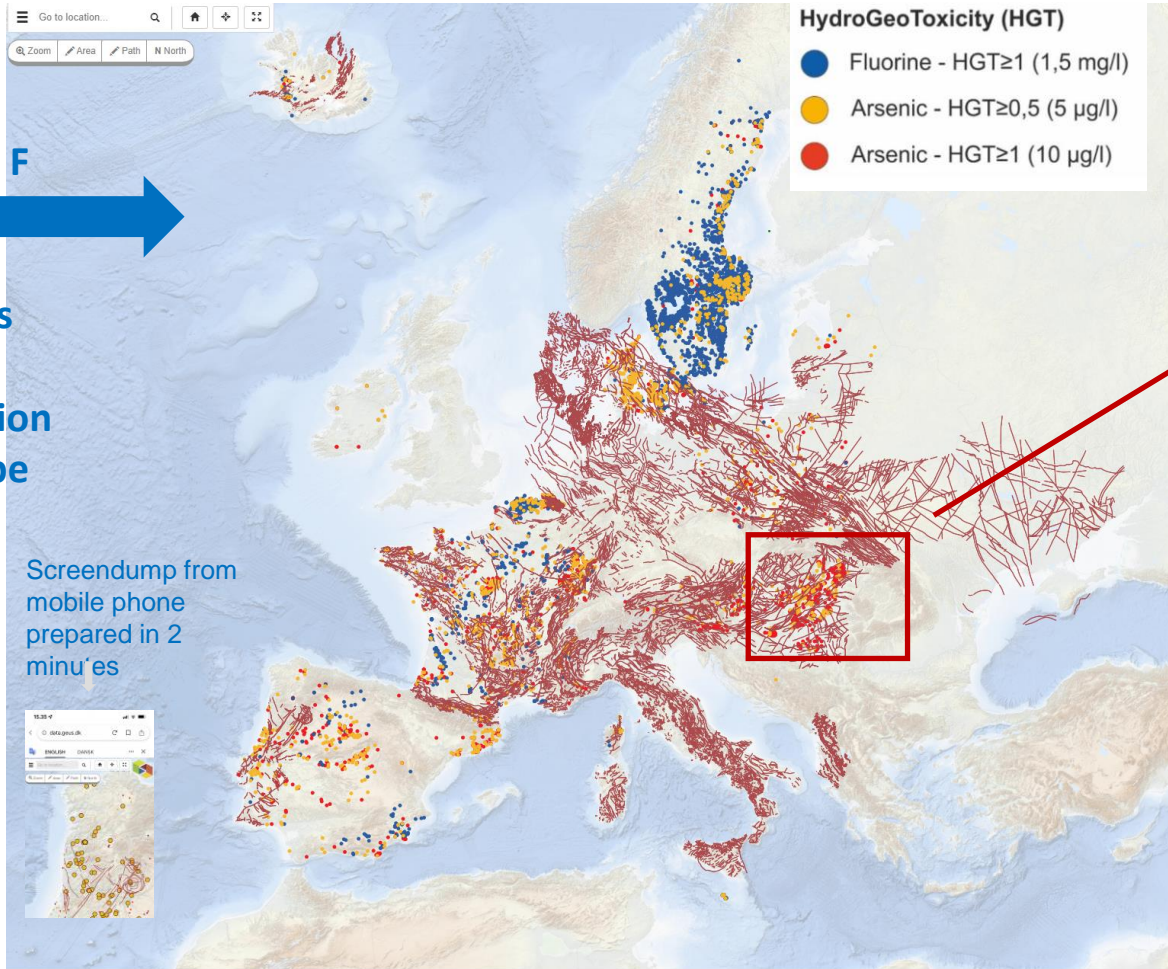
EXAMPLE COMBINING CONTRIBUTIONS FROM THE WATER RESOURCES EXPERT GROUP (As and F + geothermal data) WITH CONTRIBUTIONS FROM THE GEOENERGY EXPERT GROUP (faults)



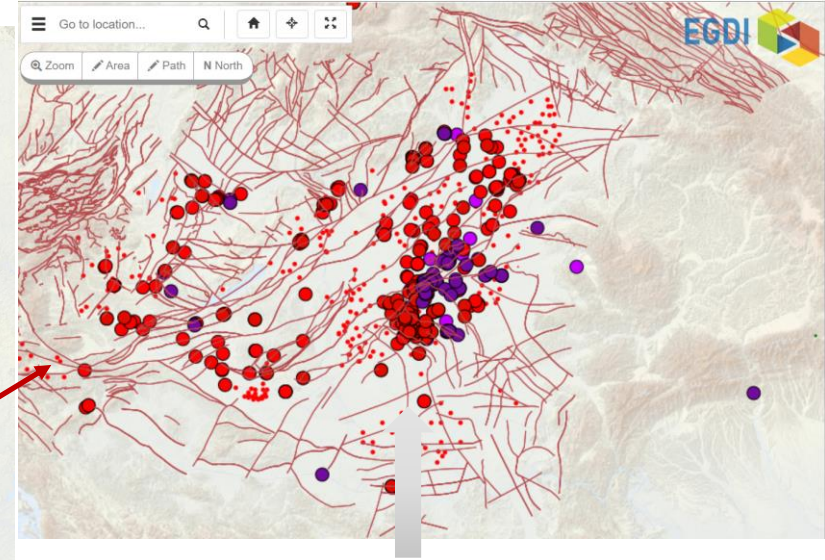
GROUNDWATER QUALITY

Combined map showing F and As groundwater concentrations above drinking water standards (HGT > 1) and their potential relation to fault systems in Europe

<https://www.europe-geology.eu/>



Screendump from mobile phone prepared in 2 minutes



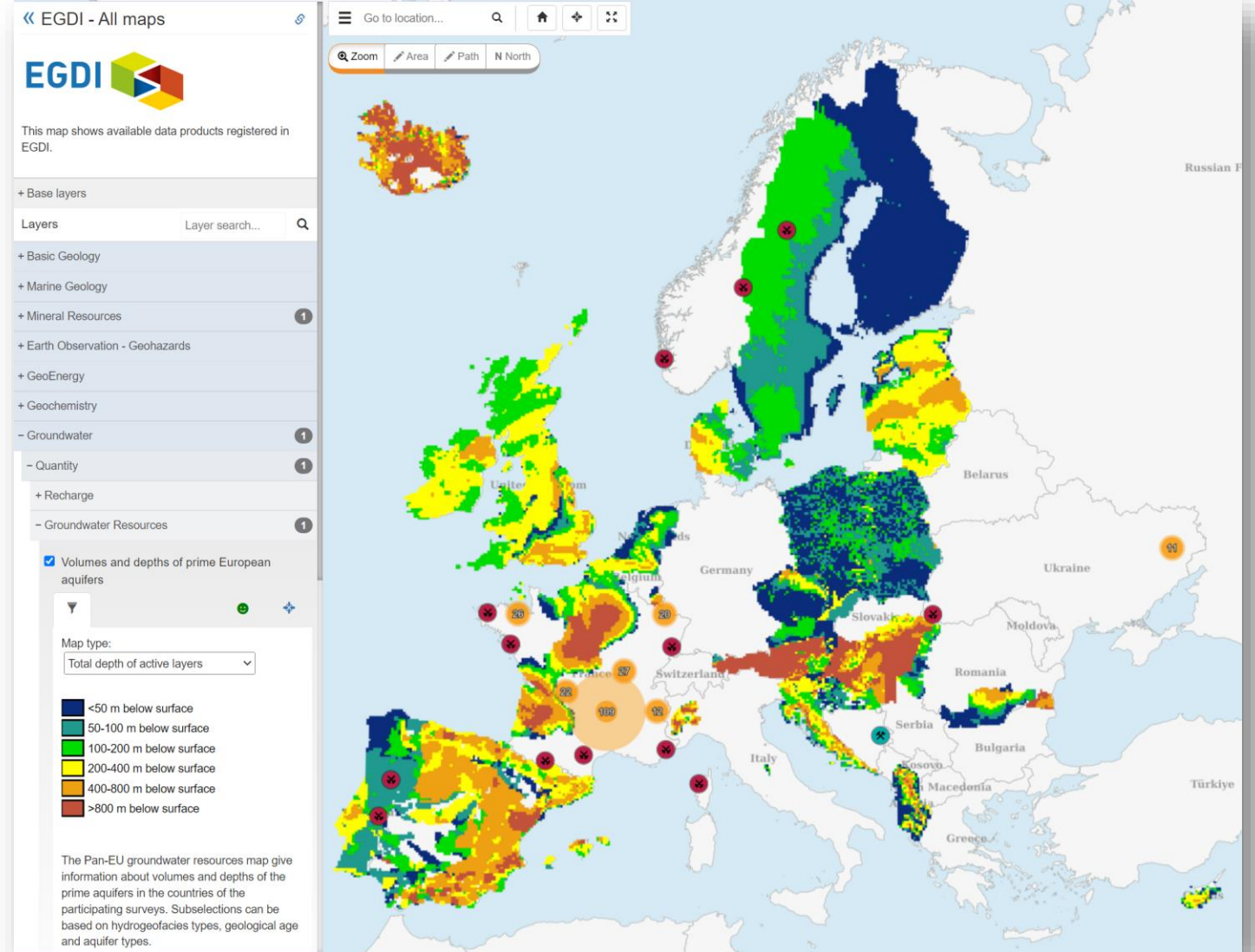
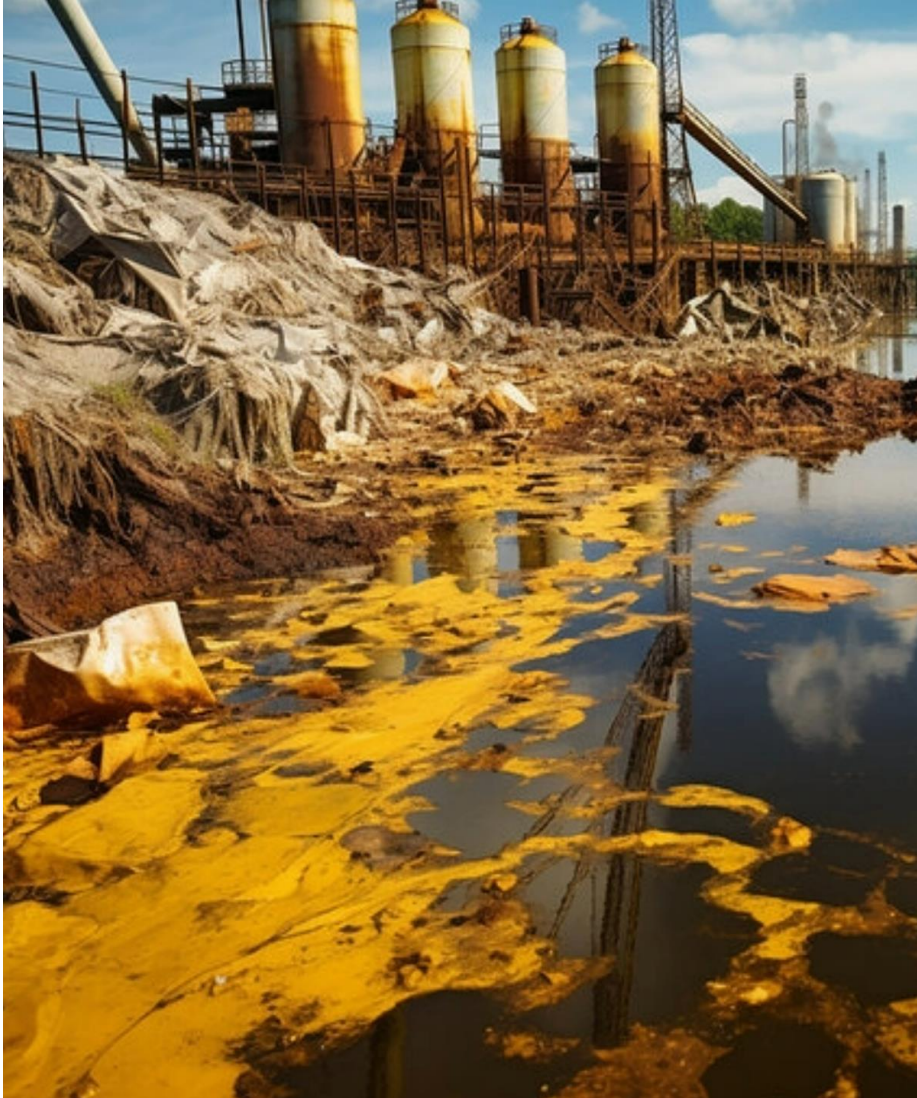
Arsenic above the EU drinking water standard (red dots) and thermal waters in selected Temp. Interval, 60 – 100 degC, (red and purple circles) in relation to faults in the Pannonian Basin, Croatia, Hungary and Serbia



Giménez-Forcada, et al. 2022. "Analysis of the geological control on the spatial distribution". Ecotoxicol. Environ. Saf. 247, 114161. <https://doi.org/10.1016/j.ecoenv.2022.114161>



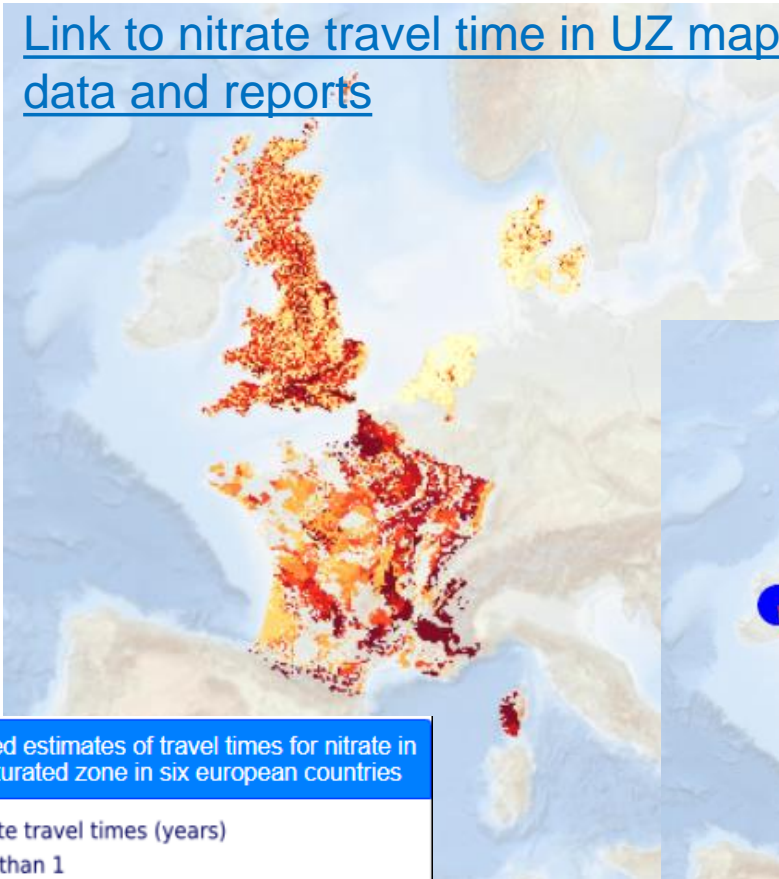
Combining maps to interpret and explore data relations and e.g. pollution risks



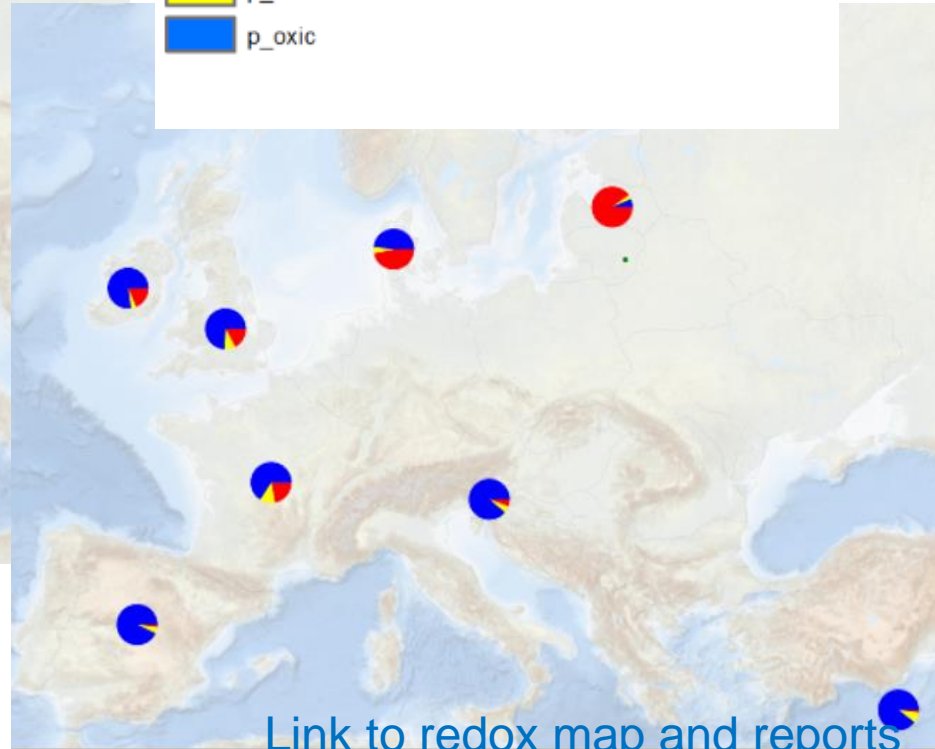


Sound understanding of physical and chemical characteristics of the subsurface is imperative to support the interpretation and assessment of contaminant distribution and migration in European groundwater etc.

[Link to nitrate travel time in UZ map, data and reports](#)

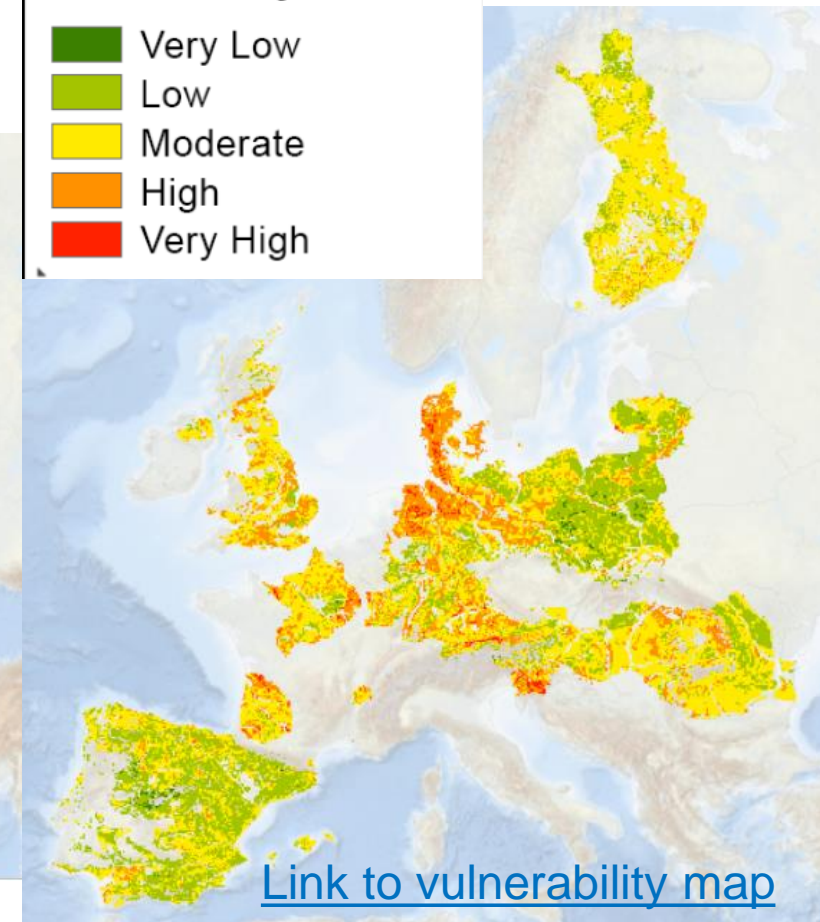
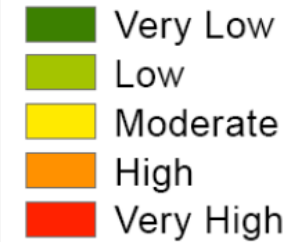


▼ Redox Potential - Denitrification data by countries (chart)



▼ Harmonized Pan-European vulnerability assessment, Vulnerability Map

DRASTIC
vulnerability classes



▼ Gridded estimates of travel times for nitrate in the unsaturated zone in six european countries

Nitrate travel times (years)



[Link to redox map and reports](#)

[Link to vulnerability map](#)



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