

# The contribution of the Geological Survey of Italy to the GeoERA programme challenges towards a Geological Service for Europe

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**ISPRA**

Istituto Superiore per la Protezione  
e la Ricerca Ambientale

*ERE1.2 GeoERA: Towards integrated European geoscience services for today's and future generations*

*Chat time: Friday, 8 May 2020, 08:30-10:15*

# Geological challenges in Europe.....

The better knowledge of the subsurface is one of the challenges faced by the Geological Survey Organizations all around the world.

In Europe, such geological challenges may contribute to the major environmental challenges identified in the European Green Deal.



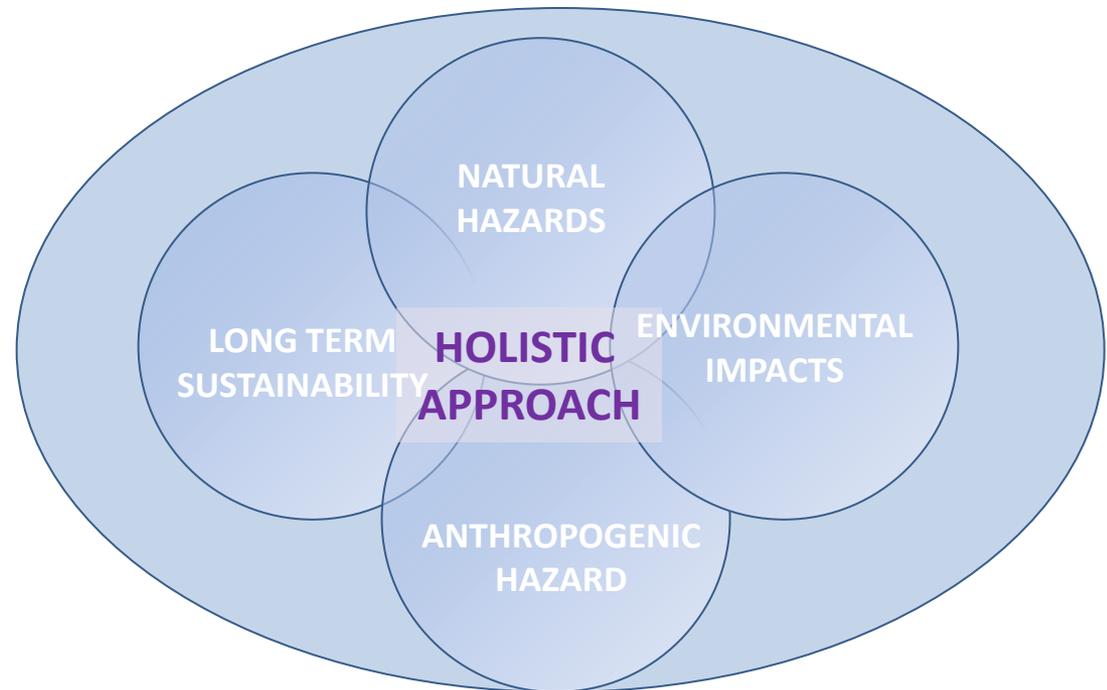
Achieving climate neutrality by 2050

Decarbonising the energy system optimise the use of mineral resources

The natural functions of ground and surface water must be restored

Accessible and interoperable data

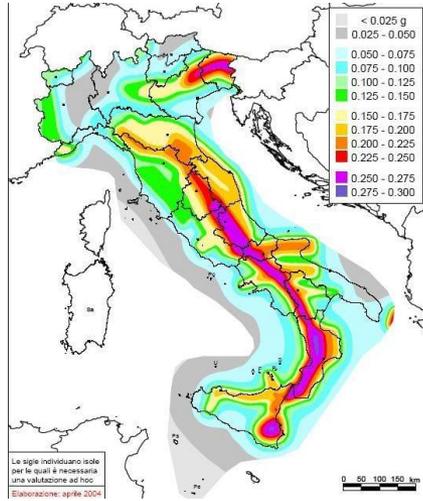
The assessment, and sustainable use, also concurrent, of subsurface resources, requires a holistic approach that takes into account also natural hazards and environmental impacts.



# Geological challenges in Italy .....

Such approach is particularly significant in Italy where:

- the large part of the territory is affected by several hazards, such as earthquakes, landslides, floods, volcanic eruptions, ground subsidence



[zonesismiche.mi.ingv.it/](http://zonesismiche.mi.ingv.it/)



- the exploitation of subsurface resources, especially in the recent years, is at the center of a scientific and political debate to address, investigate, and manage the possible interactions between human activities and natural hazards.

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Science 11 April 2014:  
Vol. 344 no. 6180 p. 141  
DOI: 10.1126/science.344.6180.141

NEWS & ANALYSIS

SEISMOLOGY

**Human Activity May Have Triggered Fatal Italian Earthquakes, Panel Says**

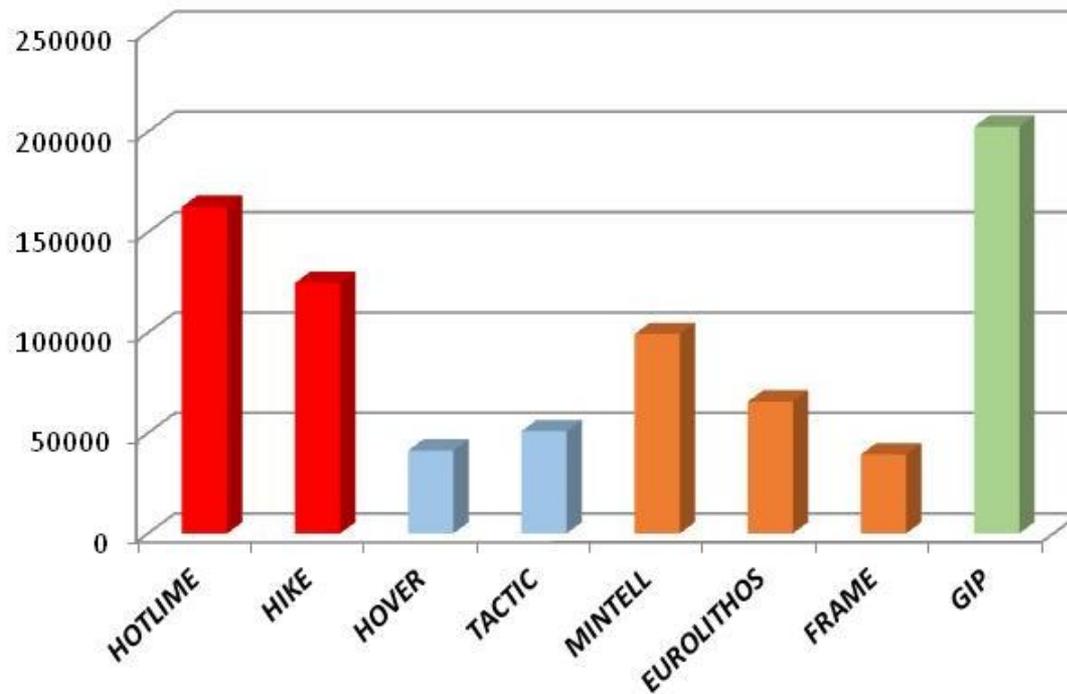
Edwin Cartledge

In an as-yet-unpublished report, an international panel of geoscientists has concluded that a pair of deadly earthquakes that struck the Italian region of Emilia-Romagna in 2012 could have been triggered by the extraction of petroleum at a local oil field. Fear of humanmade seismicity has already sparked fierce opposition against new oil and gas drilling efforts in Italy, and some say the report could lead the country's regional presidents to turn down new requests for fossil-fuel exploration.

# The contribution of Geological Survey of Italy to GeoERA



Exploration and knowledge, sustainable use and management, impacts, and publicly available information are the key topics addressed by the Geological Survey of Italy (SGI), in the GeoERA Programme, through the participation to eight projects.



GeoEnergy



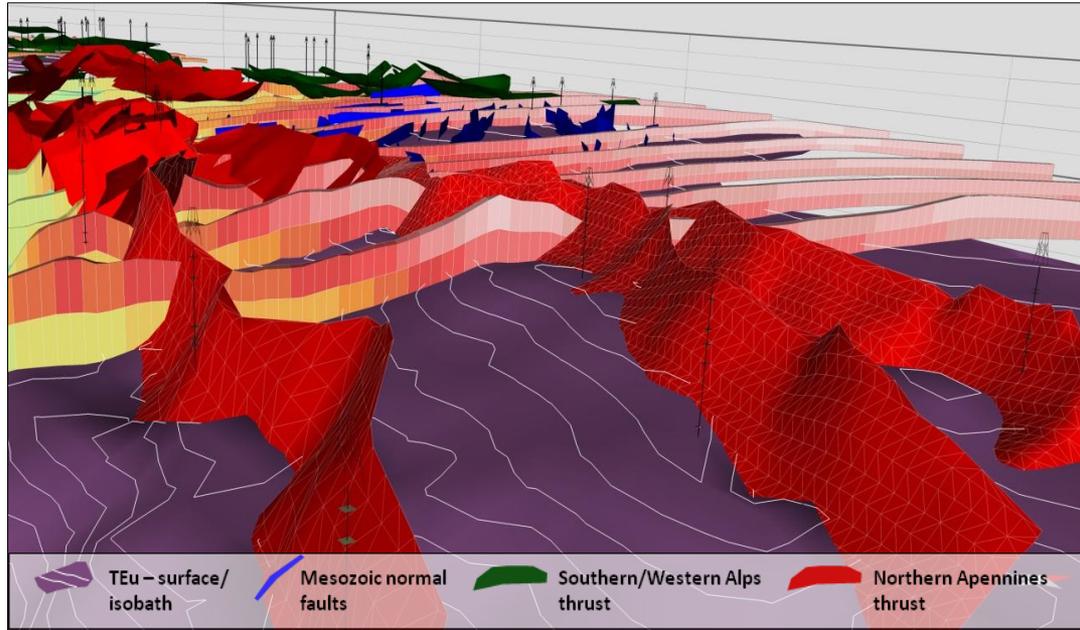
GroundWater



Raw Materials



Information  
Platform



The 3D geological model realized in the HotLime project is based on the interpretation of a huge amount of 2D seismic reflection profiles (> 26,000 km) and on the analysis of > 450 well logs, kindly provided by



ISPRA coordinated and managed the activities for the realization of the 3D geological model of the Po Plain Basin subsurface, an area larger than 25,000 km<sup>2</sup>.

The 3D model is the base input data for geothermal analysis at a supra-regional scale.



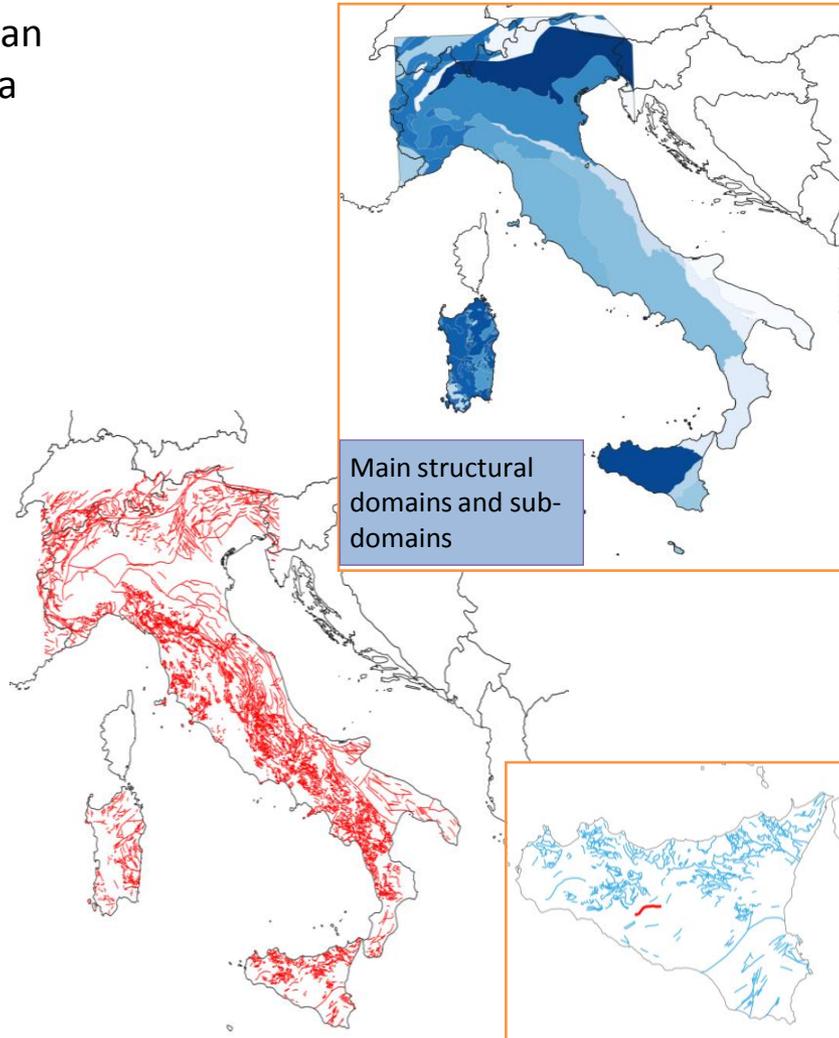
3D fault's geometries and characteristics contribute to

**European Fault Data Base HIKE** 

Geological 3D modeling of the Po Plain subsurface and similar regions, characterized by geo-energy resources and affected by natural hazards (i.e. earthquakes), is a mandatory tool for the sustainable use and management of the subsurface.

Implementation of the European Fault Database (EFD) with data provided by the GSOs.

The Geological Survey of Italy feeds the EFD information about faults characteristics, including 3D geometry and activity.



The structure of the database follows a hierarchy system both in the attributes table and in the linked semantic vocabulary (description, hierarchy, references, relationship scheme between faults and structural domains).

Feature	Value
▼ DB_Sicily_test	
▼ LOCAL_NAME	NULL
▶ (Derived)	
▶ (Actions)	
LOCAL_NAME	NULL
COUNTRY_CD	IT
ID	<b>IT-1504</b>
EVAL_METH	direct observation
OBSERV_MET	observed outcrop
FAULT_TYPE	thrust fault
LENGTH	<b>25 km</b>
DIP_DIRECT	<b>NW</b>
STRIKE	<b>E-W</b>
REFERENCE	<b>Geo map</b>
SHAPE_Leng	0,26099924668
ITHACA_URL	NULL
OBJECT-ID	<b>IT-1504</b>
OBJECTID	NULL
azimuth	72,9

Example of table of attributes for one fault (red line) in Sicilia region

The Italian fault db will also include for case-study areas thematic fault dataset (i.e. ITHACA; GeoIT3D, etc) and the data coming from other GeoERA projects (in particular HotLine).

## WP4: Assessing groundwater recharge and vulnerability to climate change

### Study area

- The North East Po Plain (Veneto Plain, Northern Italy)
- Alluvial plain filled up by fluvial deposits hosting a propus aquifer.
- Primary water usage is for irrigation, drinking water, industry
- Pilot area size is about 1150 km<sup>2</sup>

### Input Data

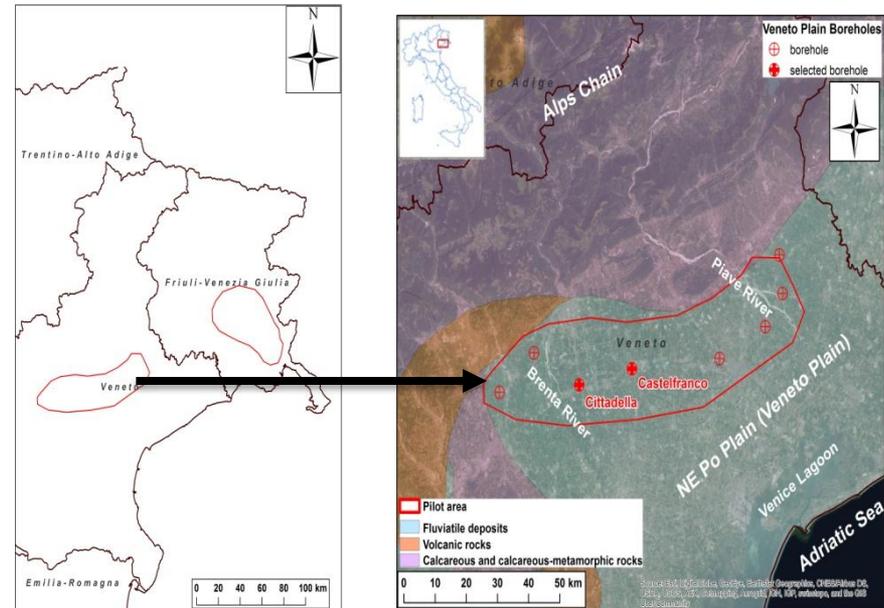
- Time series of GW observation >15 years (twice per week)
- Time series of daily rainfall > 30 years
- Potential EPT calculated from time series >30 years
- Lithological and soil data

### Methodology

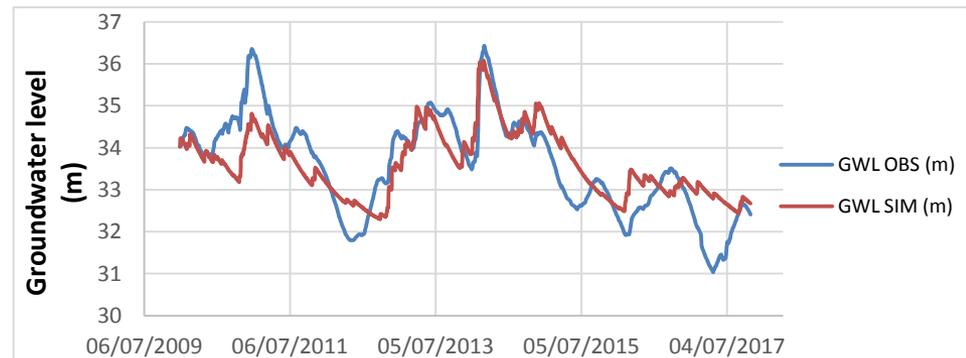
- Model calibration at observation boreholes with the integrated hydrogeological lumped model AquiMOD by BGS. Comparison of the model obtained with a second method (Gardenia by BRGM) with similar results.
- Evaluation of recharge at selected observation boreholes both using field data and climate change scenario data (in progress)

### First results

- The geological and hydrogeological features at the site are really very complex
- Two boreholes were successfully by AquimOD on 8 year data (2011-2018). A preliminary estimation of recharge (about 0.5-0.6 mm/day) was produced and looked good.
- Gardenia model was run at one of the two previous boreholes. Results were just as good and recharge similar to AquimOD
- Stream discharge and abstraction were not included since they are not significant in the boreholes area.



Geographical and hydrogeological sketch of the pilot area



Comparison between observed and simulated groundwater levels obtained after evaluation stage by Aquimod model. NSE obtained after calibration for the last years 2011-2018 series are over 0.7



## WP3: Hydrogeochemistry and health

### Study background

- The main thermal-mineral sources in Italy are aligned along the Tyrrhenian-Apeninic margin, and are associated to relevant active or quiescent magmatic bodies.
- Special water characteristics due to the great variety of geological and climatic conditions.

### Data

- 83% of the exploited thermal-mineral water resource are located in 6 regions (Tuscany, 25% of total sources; Latium, 16%; Campania, 13%; Sicily, 12%; Sardinia, 9%; Veneto, 8%).
- Collected data about coordinates, use, yield, aquifer type, lithology, temperature, main chemical parameters, etc.

### Methodology

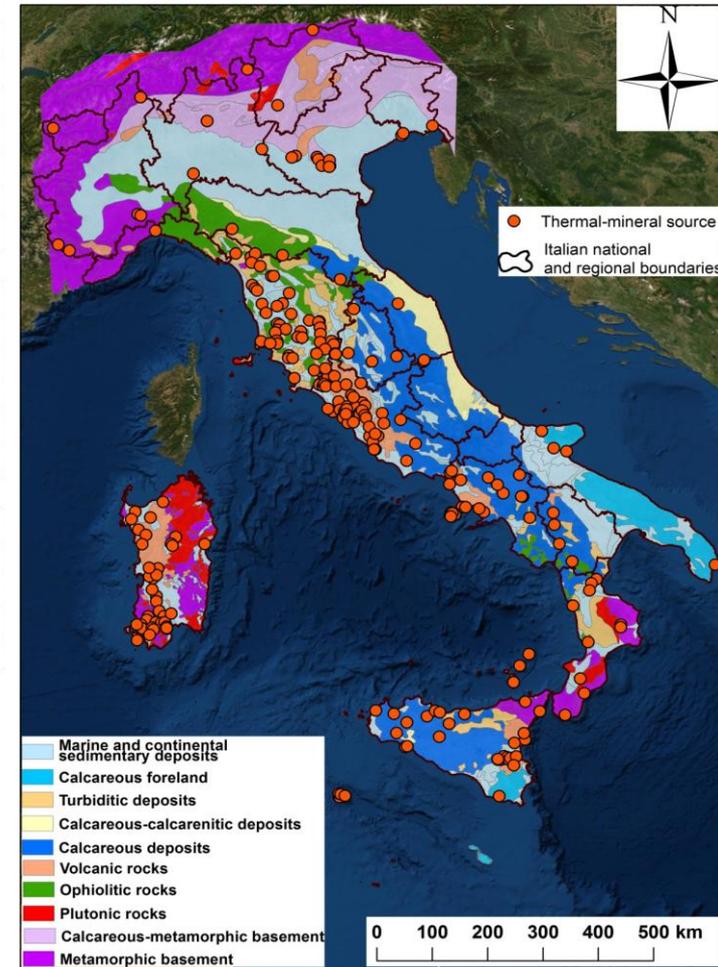
- National definitions of thermal water are mentioned by Law (323 of 24/10/2000), but not referred to technical-scientific issues;
- Some thermal-mineral water information is managed at a local or regional scale, but a comprehensive national database is still lacking.
- For contributing to fill this gap, a national database of the main thermal-mineral sources (about 240) was built.

### First results

- Most of thermal-mineral occurrences are directly associated with igneous rocks (about 56%), but also with sedimentary (about 26%) and metamorphic rocks (about 17%)
- About 70% of sources have values between 20-40 ° C.
- About 40% of sources have TDS between 1000-3000 ppm;
- About 35% of sources have yields between 1 and 5 l/s.

Lithology of the aquifer	N. of occurrences	% of occurrences
<b>IGNEOUS ROCKS (total)</b>	<b>136</b>	<b>56.4</b>
Acidic igneous material	12	5.0
Intermediate composition igneous material	16	6.6
Basic igneous material	35	14.5
Ultramafic igneous rock	2	0.8
Granitoid	16	6.6
Syenitic rock	2	0.8
Pyroclastic material	52	21.6
Pyroclastic rock	1	0.4
<b>SEDIMENTARY ROCKS (total)</b>	<b>63</b>	<b>26.1</b>
Clastic sedimentary rock	22	9.1
Carbonate rich mudstone	2	0.8
Limestone	19	7.9
Travertine	15	6.2
Dolomite	3	1.2
Peat	2	0.8
<b>METAMORPHIC ROCKS (total)</b>	<b>42</b>	<b>17.4</b>
Metamorphic rock	7	2.9
Gneiss	6	2.5
Phyllite	25	10.4
Serpentinite	3	1.2
Marble	1	0.4

*Main geological background of the Italian thermal-mineral sources included in the database of the WP3 Hover Project*



*Geological framework of the Italian thermal-mineral source included in the database of the WP3 Hover Project*

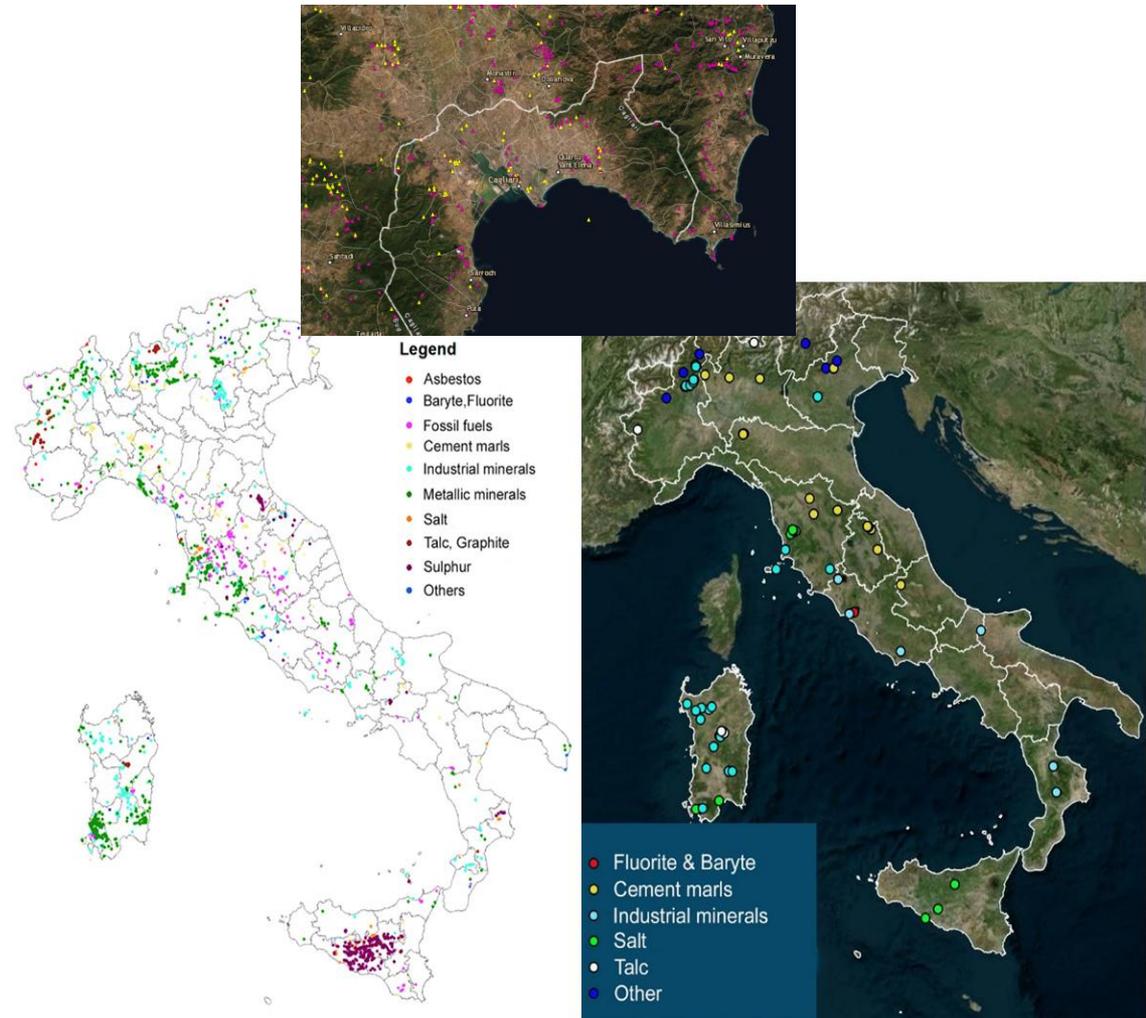


WP2: Update to Electronic European Minerals Yearbook

WP3: Minerals Inventory

WP5: Improvement of KDPs' applications and interaction with the RMIS and the EGDI

- ISPRA is involved in, cataloguing the Italian mining sites (quarries and mines: active, ceased and restored)
- The need to harmonize information has given even a great boost to the collaboration with Regional Geological Surveys sharing best practices in order to reach a national standardization.
- The flow of information has brought to implement the Italian mining information in the EGDI Platform (i.e. Minerals4EU Project) carrying on a new National Database GEMMA (in progress), including the geological, environmental, economic and cultural aspects of mines and quarries.



## WP4 Directory of ornamental stone properties

ISPRA is providing data and information for the compilation of the “identity card” for ornamental stone, about their composition, physical properties and “performance in use” criteria.

## WP3 Atlas of European Ornamental Stones

ISPRA has compiled the National Unique Stone List in order to integrate this into the European Raw Materials Knowledge Base (EURMKB) in close connection with the GeoEra Information Platform. With more than 150 records, all the Dimension Stones archived according to the UNI EN12440 Rule, have been listed for Italy.

### Deliverable D3.1

Summary on the nature and type of available spatial data in each country partner and framework for the Atlas.

	A	B	C	D	E	F	
	Stone Name	Alternative name 1	Alternative name 2	Commodity	Lithology	Colour	Name of place of
1	Alabastro di Volterra			miscellaneous	gypsum (evaporites)		Volterra
2	Ambrato di Puglia			marble	limestone		Trani
3	Arabescato			marble	marble breccia	white	Massa, Carrara
4	Arabescato Cervaiolo			marble	marble breccia	white	Seravezza
5	Arabescato Corchia			marble	marble breccia	white	Stazzema
6	Arabescato Faniello			marble	marble breccia	white	Stazzema
7	Arabaescato Gioia			marble	marble breccia	white	Carrara
8	Arabescato Orobico			limestone	limestone	brown	Camerata Cornell
9	Arabescato Orobico			limestone	limestone	red	Camerata Cornell
10	Arabescato Orobico			limestone	limestone	pink	Camerata Cornell
11	Arabescato Orobico			limestone	limestone	grey	Camerata Cornell
12	Arabescato Vagli			marble	marble breccia	white	Vagli
13	Ardesia Fontana Buona			slate	calcareous slate	grey	Lorsica, Mocones
14	Ardesia Valle Argentina			slate	calcareous slate	grey	Triora
15	Arenaria Grigia dei Nebrodi			sandstone	quartzarenite	grey	Nebrodi
16	Arenaria di Casso			sandstone	sandstone	grey	Terenzo
17	Arenaria di Val Gardena			sandstone	sandstone	red	Meltina

## Work package 7 – Historical mining sites revisited

### Identification of potential target areas for case studies - Study area

- The Island of Sardinia (Italy)
- Closed mining waste facilities,
- The wastes were produced during the old mining industries, that operated between the late 1800s and late 1900s approximately

**1 case in the NW  
3 case in the SW**



### Methodology and data

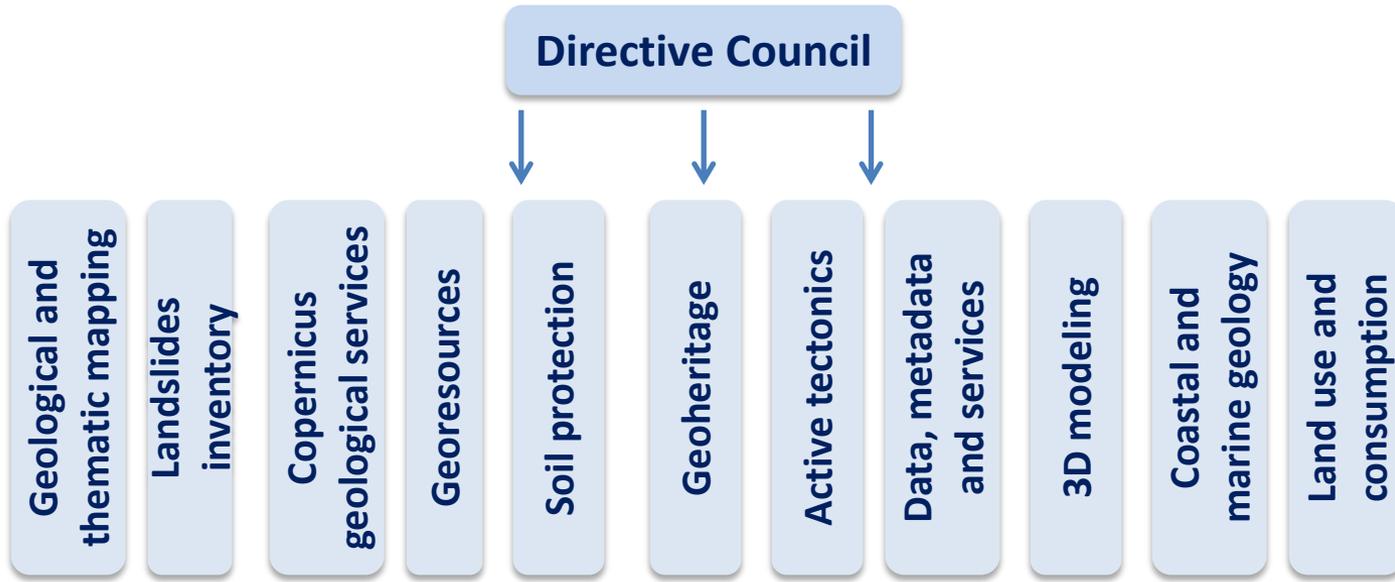
- Project partners proposed some potential case studies of closed mining sites with potential availability of recoverable elements in historical mining waste,
- Mining waste was characterized in previous reclamation activities and the analytical data would seem to indicate a potential availability of elements considered raw materials, even critical ones.

Name of deposit	Main commodity 1	Main commodity 2	CRM 1	CRM 2	CRM 3	Data source
Monteponi	Galena	Sfalerite Galena	Cadmio	Cianuro	Piombo/Zinco	<a href="#">national database</a>
Ingurtosu	Blenda/Siderite	argentifera Galena	Fluoruri	Cadmio	Piombo/Zinco	<a href="#">national database</a>
Montevecchio	Blenda/Pirite	argentifera	Bismuto	Fluoruri	Cadmio	national database
Argentiera	Blenda/Galena	Antimonite	Antimonio	Argento	Cadmio	national database



# The Italian Network of Regional Geological Surveys (RISG): a contribution to GeoERA

- ISPRA coordinates a network of 21 “Regional Geological Surveys” established by Law in 2000 and reactivated in the last 2 years
- 1 Directive Council, with strategic role
- 11 Thematic Groups, with operational and technical mandate



- Three regional geological surveys are full partners in GeoERA

## Emilia Romagna

HotLime  
HIKE  
TACTIC  
EUROLITHOS



## Piemonte

HotLime  
HIKE



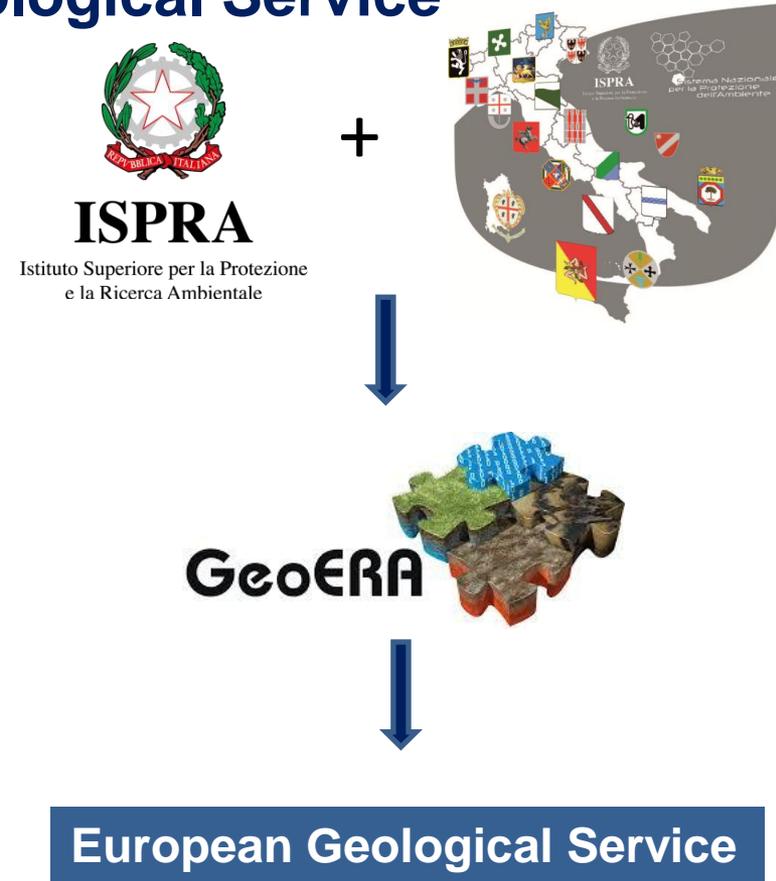
## Umbria

HotLime  
MINTELL4EU



# Towards an European Geological Service

- Through the participation to 8 GeoERA projects, the Italian Geological Survey, ISPRA is providing a relevant contribute to face with geological challenges both at national and EU level.
- Three regional geological surveys with geological mandate at local level will provide an added value to GeoERA, within the network of regional geological services, coordinated by ISPRA.



- In a long term perspective, all these actions should be aimed at developing an European Geological Service built on stable joint cooperation among national and regional geological surveys.
- This will be the final goal of the GeoERA Programme and has to be developed through the most suitable tool (European Partnership or Coordinated Supporting Action).