

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

Luca Guerrieri, Carlo Cipolloni, Chiara D'Ambrogi, Barbara Dessì, Pio Di Manna,
Mauro Lucarini, Lucio Martarelli and Monica Serra

Geological Survey of Italy, ISPRA



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.



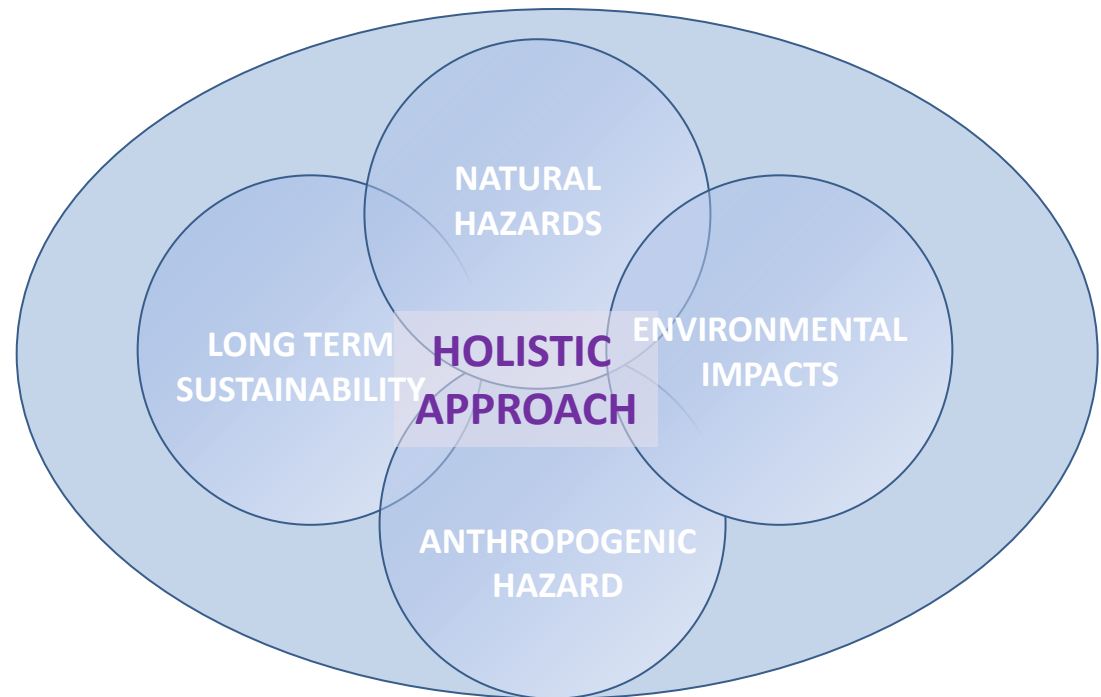
Achieving climate neutrality by 2050

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

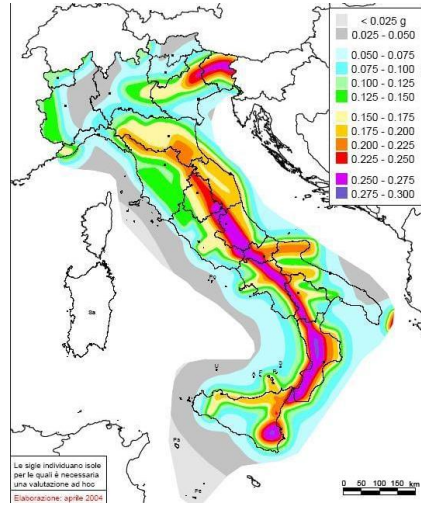
The assessment, and sustainable use, also concurrent, of subsurface resources, requires a holistic approach that takes into account also natural hazards and environmental impacts.



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/



- 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.

Science AAAS.ORG | FEEDBACK | HELP | LIBRARIANS All Science Journals Enter Search Term

NEWS SCIENCE JOURNALS CAREERS MULTIMEDIA COLLECTIONS

Science The World's Leading Journal of Original Scientific Research, Global News, and Commentary.

Science Home Current Issue Previous Issues Science Express Science Products My Science About the Journal

Home > Science Magazine > 11 April 2014 > Cartidge, 344 (6180): 141

Article Views

- Summary
- Full Text
- Full Text (PDF)

Article Tools

- Save to My Folders
- Download Citation
- Alert Me When Article is Cited
- Post to CiteULike
- Article Usage Statistics

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

< Prev | Table of Contents | Next >
Read Full Text to Comment (0)

NEWS & ANALYSIS

SEISMOLOGY

Human Activity May Have Triggered Fatal Italian Earthquakes, Panel Says

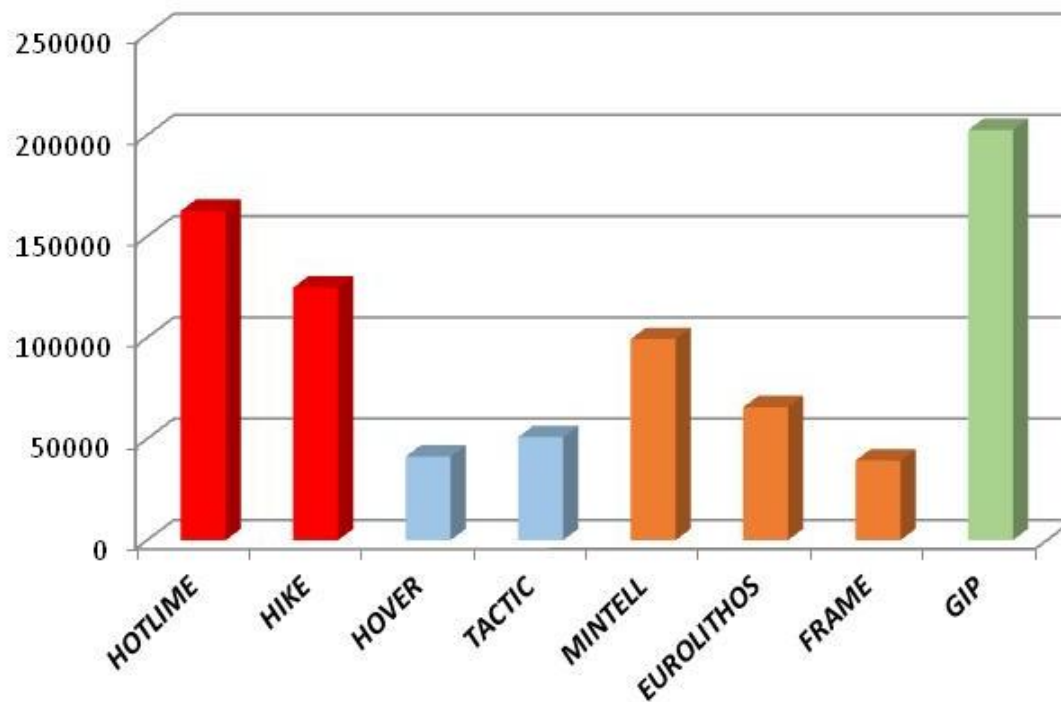
Edwin Cartidge

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



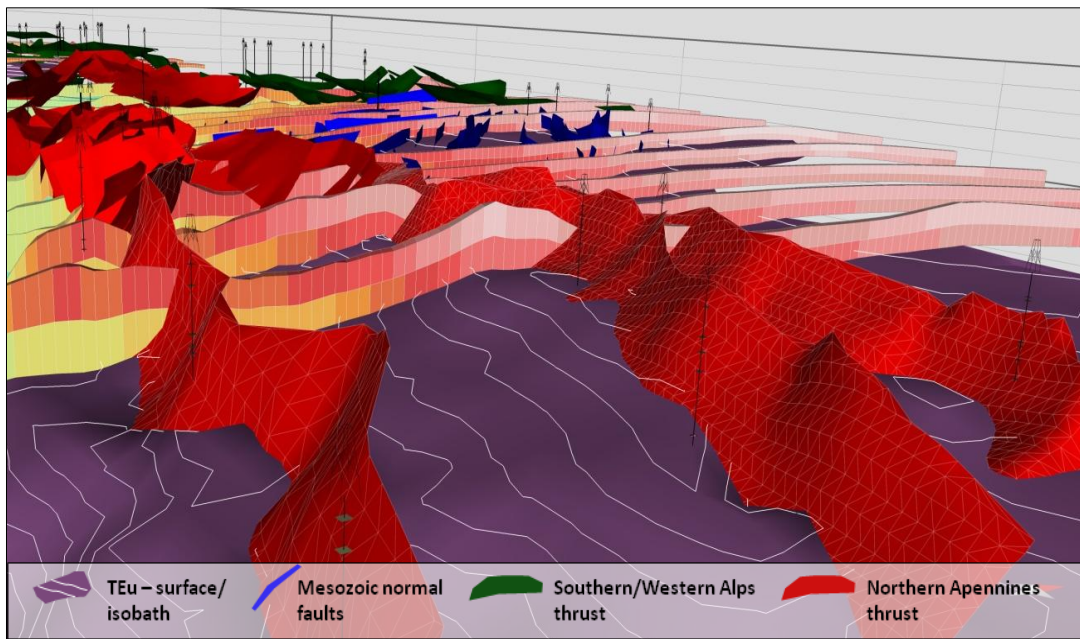
GroundWater



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 km².

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

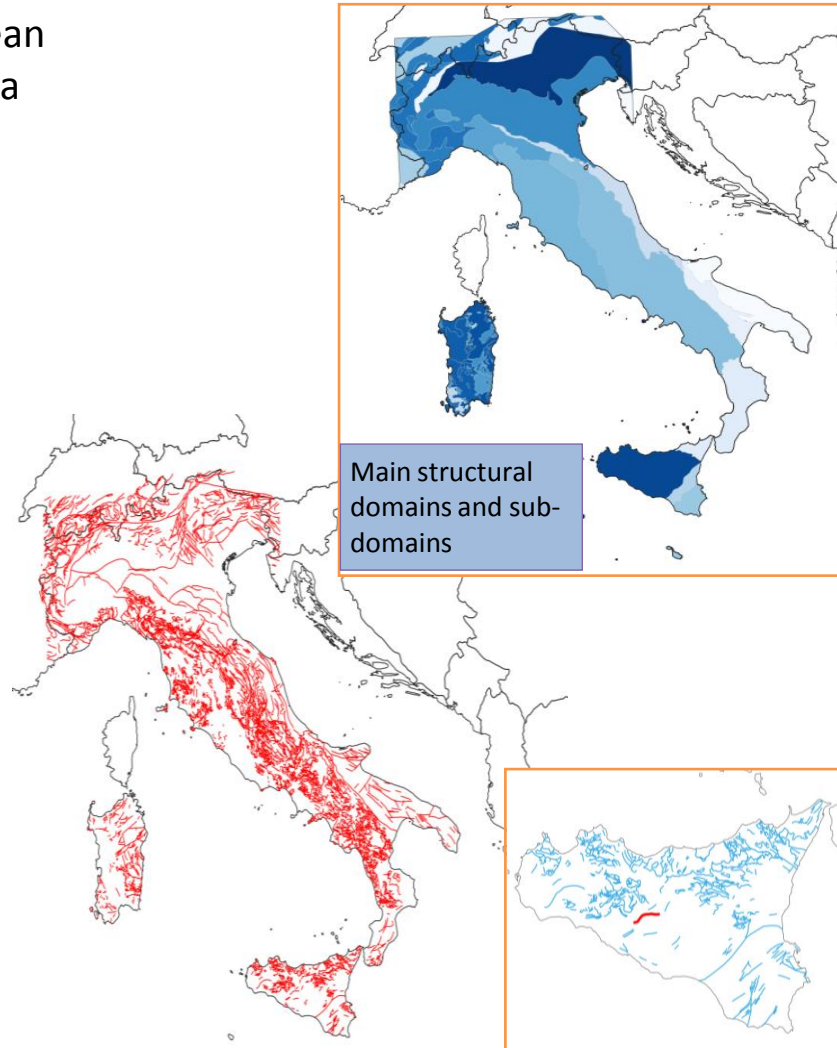


Geological 3D modeling of the Po Plain subsurface and similar regions, characterized by geo-energy resources and affected by natural hazards (i.e. earthquakes), is a mandatory tool for the sustainable use and management of the subsurface.

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	IT-1504
EVAL_METH	direct observation
OBSERV_MET	observed outcrop
FAULT_TYPE	thrust fault
LENGTH	25 km
DIP_DIRECT	NW
STRIKE	E-W
REFERENCE	Geo map
SHAPE_Leng	0,26099924668
ITHACA_URL	NULL
OBJECT-ID	IT-1504
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 km²

Input Data

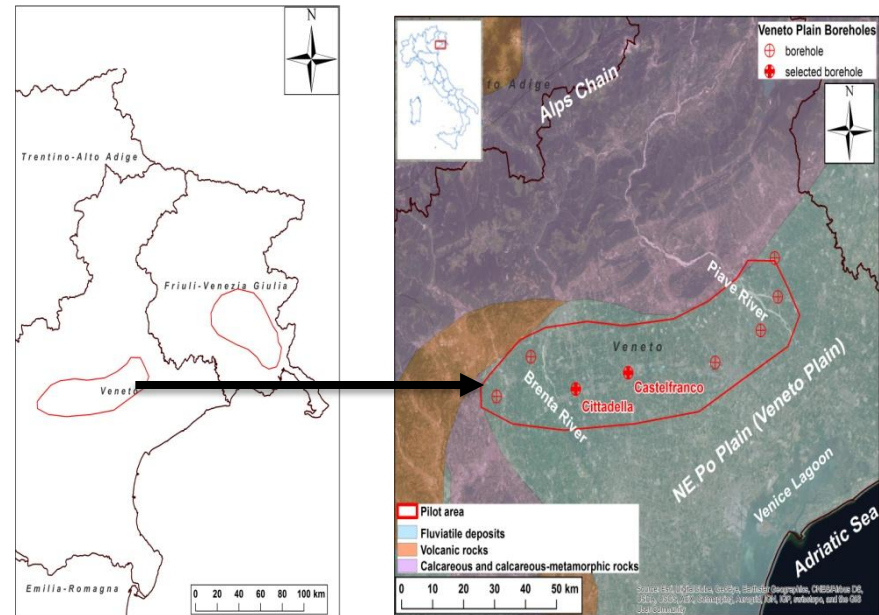
- Time series of GW observation >15 years (twice per week)
- Time series of daily rainfall > 30 years
- Potential EPT calculated from time series >30 years
- Lithological and soil data

Methodology

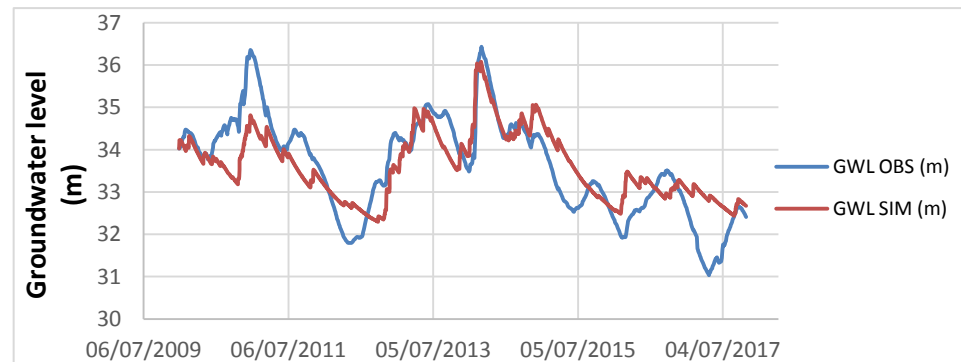
- Model calibration at observation boreholes with the integrated hydrogeological lumped model AquiMOD by BGS. Comparison of the model obtained with a second method (Gardenia by BRGM) with similar results.
- Evaluation of recharge at selected observation boreholes both using field data and climate change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

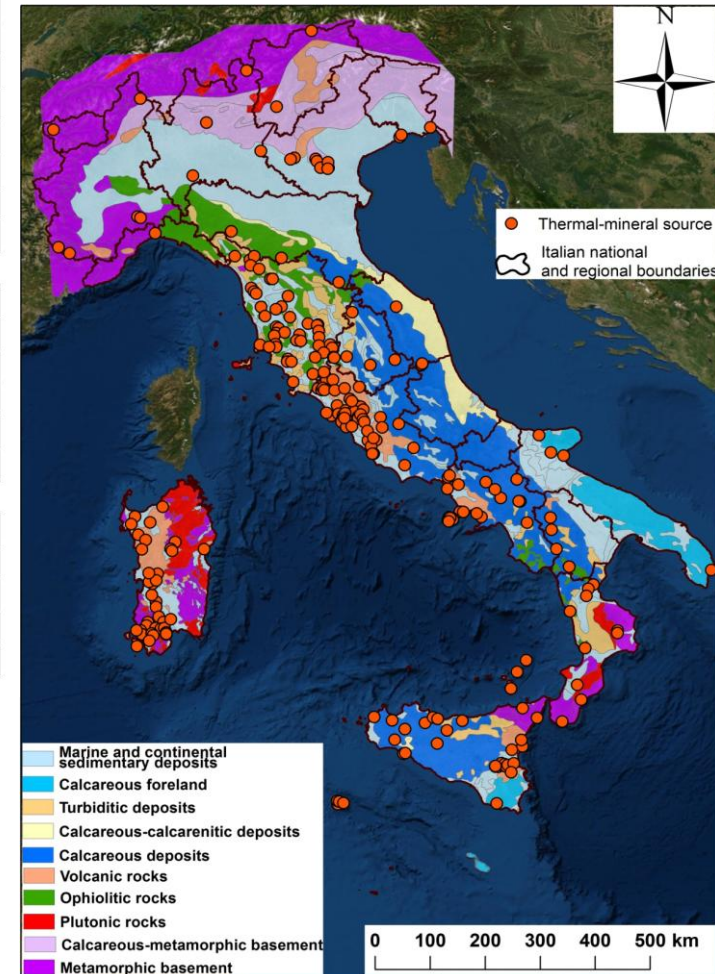
- National definitions of thermal water are mentioned by Law (323 of 24/10/2000), but not referred to technical-scientific issues;
- Some thermal-mineral water information is managed at a local or regional scale, but a comprehensive national database is still lacking.
- For contributing to fill this 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
IGNEOUS ROCKS (total)	136	56.4
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
SEDIMENTARY ROCKS (total)	63	26.1
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
METAMORPHIC ROCKS (total)	42	17.4
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

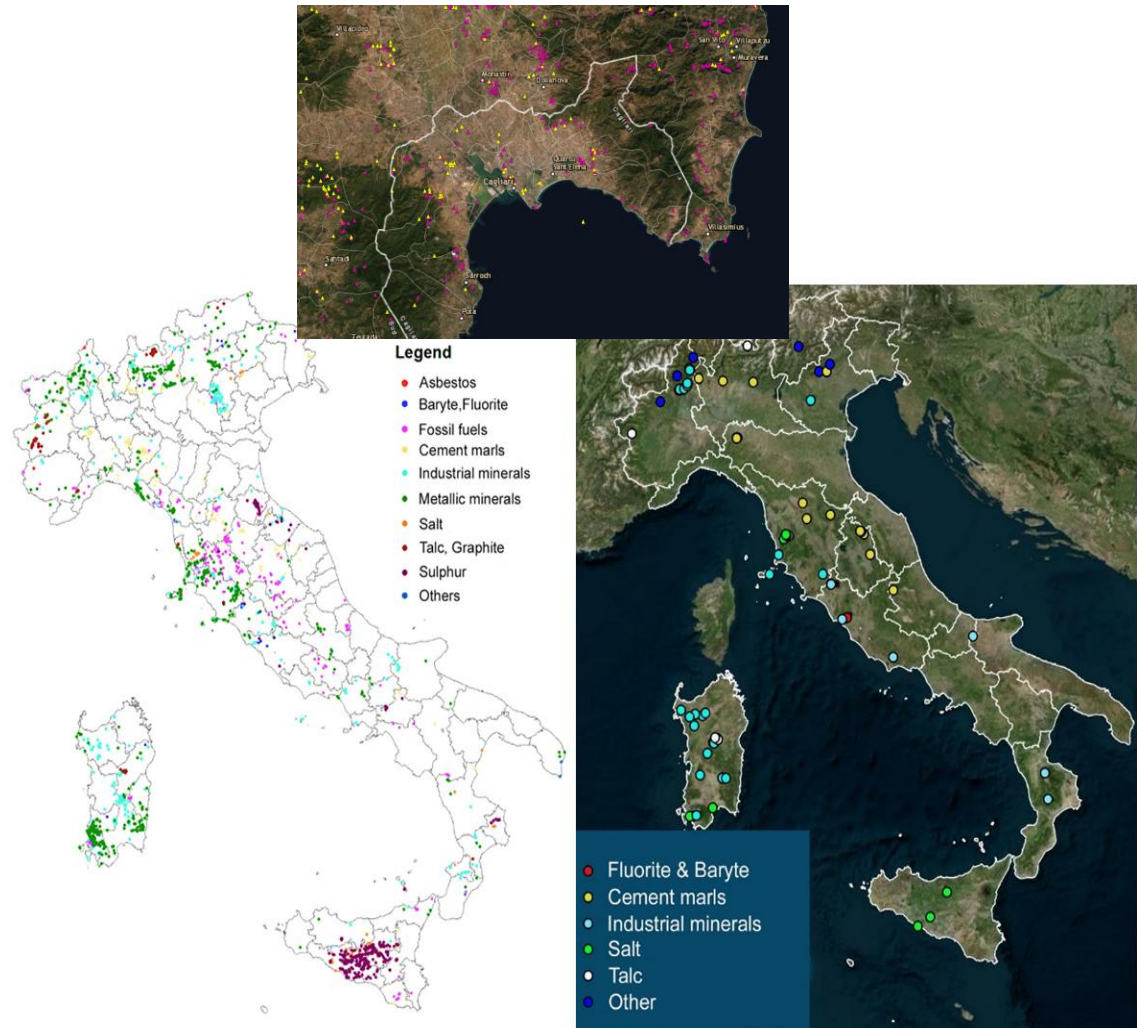


WP2: Update to Electronic European Minerals Yearbook

WP3: Minerals Inventory

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

- 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 EGD 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.

Deliverable D3.1

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

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.

	A	B	C	D	E	F	
1	Stone Name	Alternative name 1	Alternative name 2	Commodity	Lithology	Colour	Name of place of
2	Alabastro di Volterra			miscellaneous	gypsum (evaporites)		Volterra
3	Ambrato di Puglia			marble	limestone		Trani
4	Arabescato			marble	marble breccia	white	Massa, Carrara
5	Arabescato Cervaiolo			marble	marble breccia	white	Seravezza
6	Arabescato Corchia			marble	marble breccia	white	Stazzema
7	Arabescato Faniello			marble	marble breccia	white	Stazzema
8	Arabescato Gioia			marble	marble breccia	white	Carrara
9	Arabescato Orobico			limestone	limestone	brown	Camerata Cornelli
10	Arabescato Orobico			limestone	limestone	red	Camerata Cornelli
11	Arabescato Orobico			limestone	limestone	pink	Camerata Cornelli
12	Arabescato Orobico			limestone	limestone	grey	Camerata Cornelli
13	Arabescato Vagli			marble	marble breccia	white	Vagli
14	Ardesia Fontana Buona			slate	calcareous slate	grey	Lorsica, Moconesi
15	Ardesia Valle Argentina			slate	calcareous slate	grey	Triora
16	Arenaria Grigia dei Nebrodi			sandstone	quartzarenite	grey	Nebrodi
17	Arenaria di Casso			sandstone	sandstone	grey	Terenzo
18	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	Cadmio	Cianuro	Piombo/Zinco	national database
Ingurtoosu	Blenda/Siderite	argentifera	Fluoruri	Cadmio	Piombo/Zinco	national database
Montevecchio	Blenda/Pirite	argentifera	Bismuto	Fluoruri	Cadmio	national database
Argentiera	Blenda/Galena	Antimonite	Antimonio	Argento	Cadmio	national database



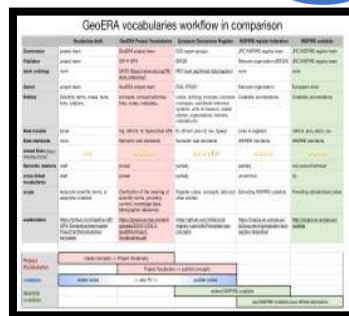
WP 2: GPS User Requirements



WP 3: Standards and interoperability issues



WP 4: Semantic harmonisation issues



WP 6-7: Developments (central)



WP8: Data provider support

Set-up a support central repository where is stored online guidelines and set-up a eLearning platform

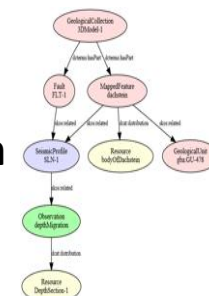


WP11: Communication and dissemination

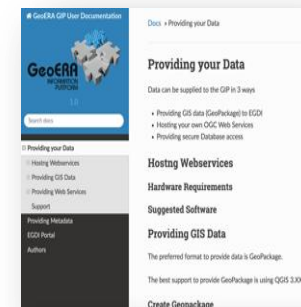


23 Standard data models to map GPS data and recommendations to improve
Provide a Validation system

Project vocabulary- share knowledge and terminology in the form of project specific vocabulary concepts on a scientific level and to use them in datasets to code data



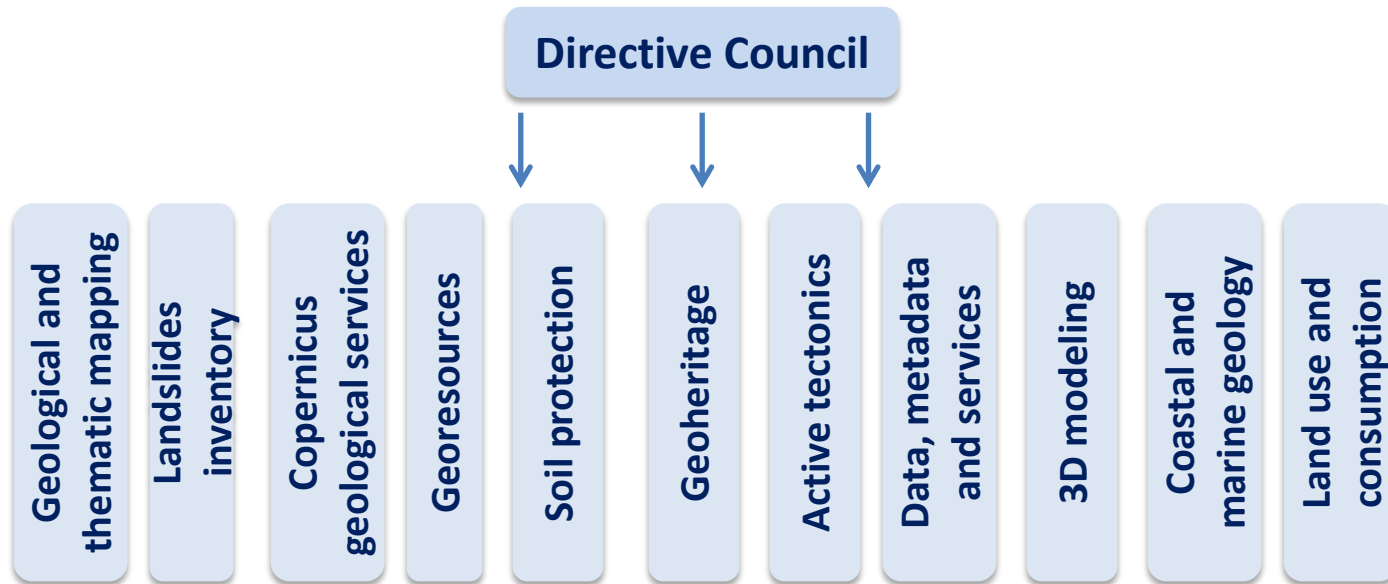
Support in developed some integrated tools to enrich semantic search and validation of dataset and metadata in the central harvest system



Communication plan and project brochure

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



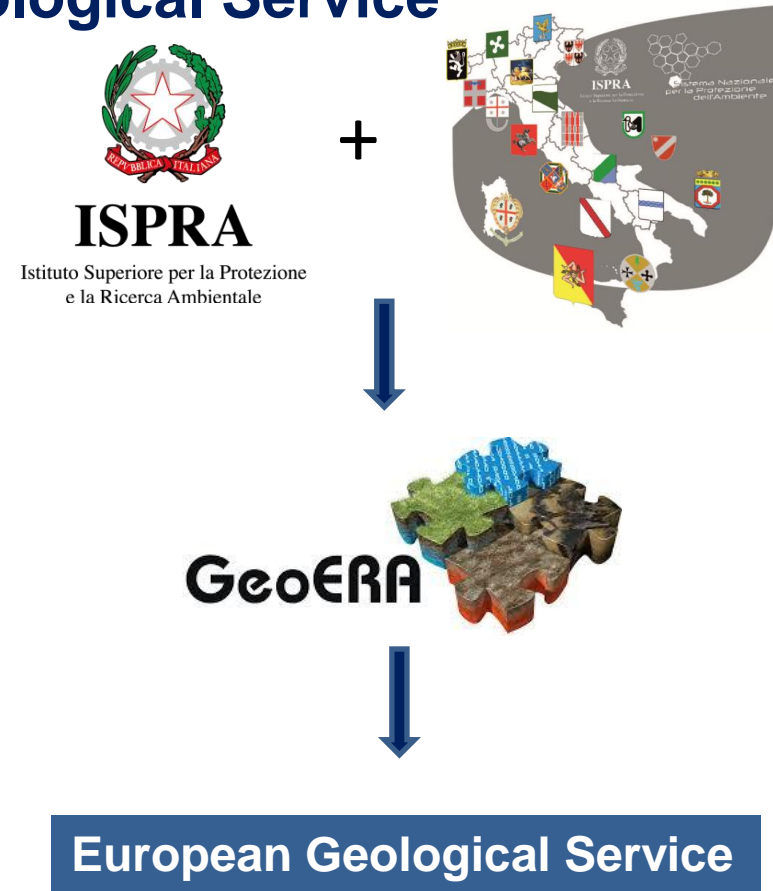
Umbria

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).