

# EUROGEOSURVEYS

The Association of the Geological Surveys of Europe

[www.eurogeosurveys.org](http://www.eurogeosurveys.org)

## The role of EuroGeoSurveys in the development of a geoscientific data infrastructure in Europe based on INSPIRE



Francois Robida (BRGM)

*Chair EGS INSPIRE Expert Group*



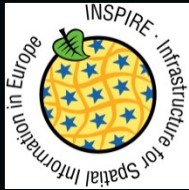
# Context : SHARING GEOSCIENTIFIC INFORMATION through an European Geological Infrastructure

- A need for Interoperability
  - Interoperability = “Ability to co-operate” (Nato)
  - Need to share information with other geologists ... and with non-geologists
  - Not only a technical question, an economic and cultural issue !
- Inspire : a strong “incentive” in Europe
- but also SEIS, GMES, GEO/GEOSS
- European /Global initiatives of our community :
  - OneGeology, GeoSciML, Promine, Pangeo, Eurogeosources
  - eEarth, eWater, Geomind,...
  - ... GeORG



# INSPIRE, a European Directive

- To establish the Infrastructure of Spatial Information in Europe, for the purposes of Community environmental policies
  
- 5 chapters in INSPIRE regulation :
  - Metadata
  - Data specification
  - Network services
  - Data sharing
  - Monitoring and reporting



# INSPIRE, 34 data themes

## Annex I

1. Coordinate reference systems
2. Geographical grid systems
3. Geographical names
4. Administrative units
5. Addresses
6. Cadastral parcels
7. Transport networks
8. Hydrography
9. Protected sites

## Annex II

1. Elevation
2. Land cover
3. Orthoimagery
4. **Geology**

## Annex III

1. Statistical units
2. Buildings
3. Soil
4. Land use
5. Human health and safety
6. Utility and Government services
7. Environmental monitoring facilities
8. Production and industrial facilities
9. Agricultural and aquaculture facilities
10. Population distribution – demography
11. Area management
12. **Natural risk zones**
13. Atmospheric conditions
14. Meteorological geographical features
15. Oceanographic geographical features
16. Sea regions
17. Bio-geographical regions
18. Habitats and biotopes
19. Species distribution
20. **Energy resources**
21. **Mineral resources**



# EuroGeoSurveys participation to INSPIRE

- Coordination through an **“EGS GI & INSPIRE” Expert Group**
- **EGS member of INSPIRE Expert(s) Group(s) (since 2002)**
- **EGS registered as a “Spatial Data Interest Community” (SDIC)**
  - Some EGS members registered as LMOs (Legally Mandated Organisations) : UK, Germany, Netherlands, Norway, Italy, Switzerland, Latvia, France,...
- **EGS experts participate to “Implementing Rules Drafting Teams”:**
  - NGU - Per Ryghaug (Metadata support team)
  - BGR – Christine Asch (Data Harmonisation support team)
  - BRGM – Francis Bertrand (Data Harmonisation support team)
  - BRGM - Jean-Jacques Serrano (chair Network Services team)
  - BGS - Ian Jackson (Data Sharing and re-use support team)
- **15 EGS experts in the “Thematic Working Groups” (Geology, Mineral Resources, Risk Zones)**
- **Coordination of actions contributions through the “INSPIRE and Geographic Information” Expert Group**

→ *Clearly the most active and visible community (apart from mapping agencies)*



# Challenges of the Geology Thematic Working Group

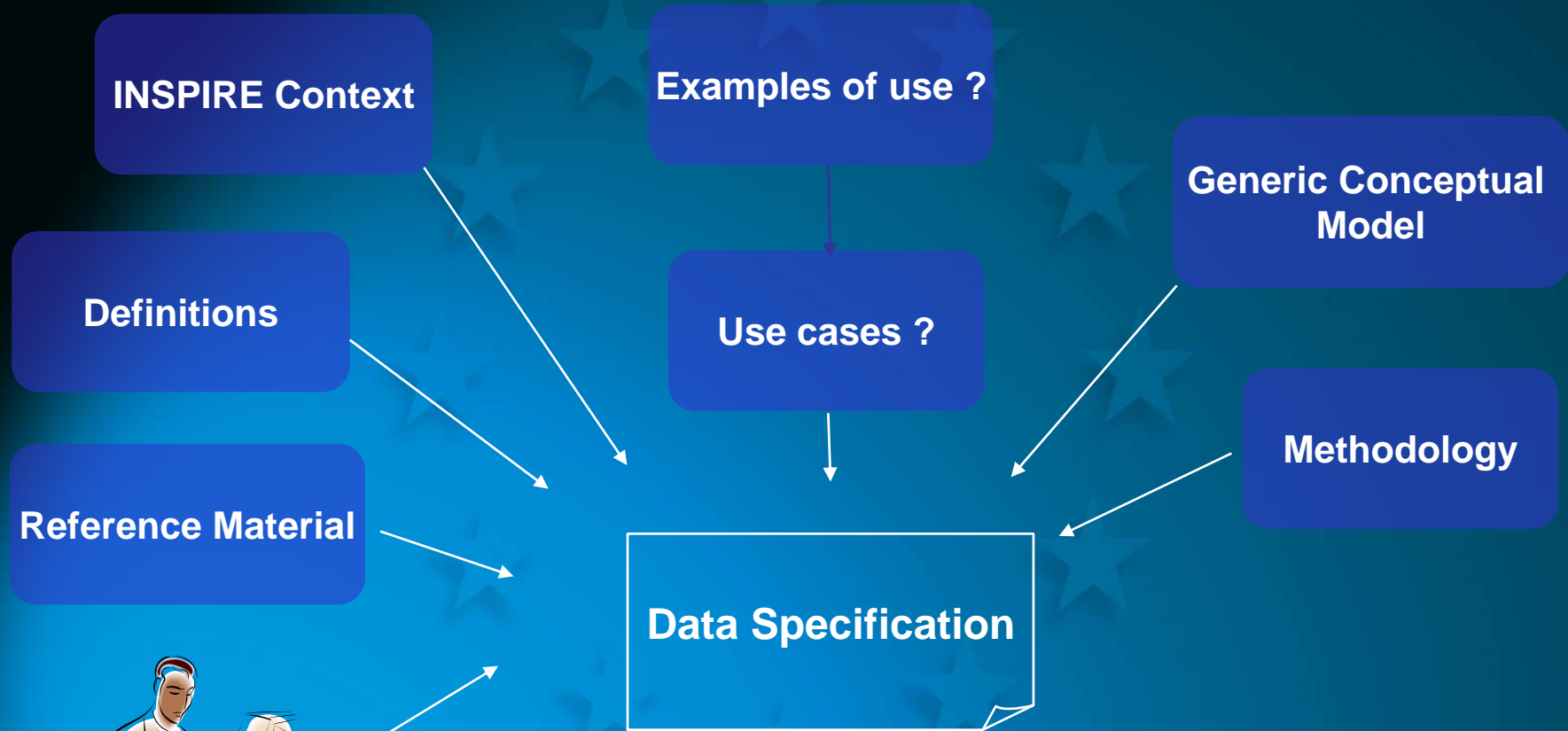
- Derive operational specifications covering the Geology data theme, in line with the legal definition in the text of the Directive :

***“Geology characterized according to composition and structure. Includes bedrock, aquifers and geomorphology.”***

- Scale ? Maps ? 3D ? Boreholes ? Geophysics ?...



# Geology Thematic Working Group **JUST** started to work – 21/05/2010



Standard Data models: GeoSciML, EarthResourceML, GroundWaterML, ...  
Projects: OneGeology-Europe, ProMine, PanGeo, ...



# Which level of harmonisation is « just right »?

Simple



Complex

Too simple

- Identified requirements cannot be supported
- Insufficient harmonisation
- Few benefits

Too complex

- Difficult to implement
- Substantial benefits available only to a few users
- High cost





# GeoSciML



a language for geoscience data interoperability

- An international initiative : *the GeoSciML Interoperability Working Group*
  - Formed in 2003 under the Commission for the Management and Application of Geoscience Information (CGI) of the International Union of Geological Sciences (IUGS)
  - It is currently comprised of geology and information technology specialists from 9 countries across Europe, North America, Australia and Asia (Australia, Canada, France, Germany, Italy, Japan, Sweden , UK, USA)
  - On a voluntary basis



**The OneGeology Project and  
~~compliance~~ to the INSPIRE Directive  
*contribution***

# INSPIRE, a European Directive



geological



- To establish the Infrastructure of Spatial Information in Europe, for the purposes of Community environmental policies

- 5 chapters in INSPIRE regulation :



- Metadata
- Data specification
- Network services
- Data sharing
- Monitoring and reporting



# OneGeology-Europe ... an INSPIRE pilot

- The European contribution to the global OneGeology initiative

That includes:

- making geological information of Europe available for everyone,
- at a 1:1 Million scale,
- web accessible,
- interoperable,
- with „**progress towards harmonisation**“

# Basic principles

- Based on “**interoperability**” principles
- Maps produced on **distributed servers** and sent directly to web client (user side)
- Every participant delivers its map through a standard web service (WMS / WFS)
- The list of metadata of maps / services is collected into a catalogue of services managed “centrally”
- The portal can display / aggregate all the maps

# WMS – WFS ?

Two ISO/OGC standards of web services to give access to geographical information through web portals and/or GIS tools

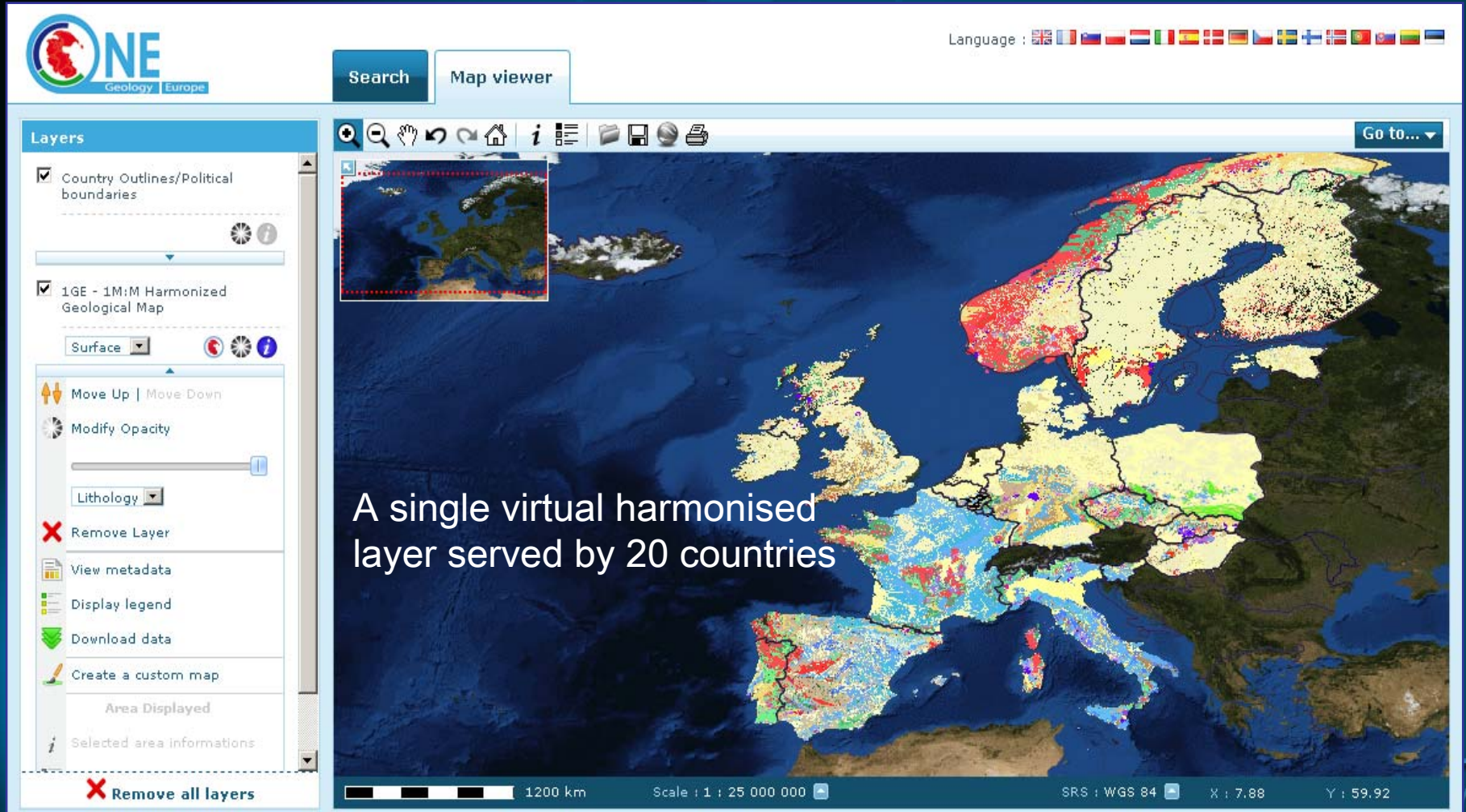
- WMS - Web Map Service : produces an image (raster)
  - WFS - Web Feature Service : provides data
    - Geometry (points, polygons, lines,...)
    - Attributes
- In a standardised text format (GML / GeoSciML)



## Some of the achievements of the project (direct contributions to INSPIRE)

- User needs and gap analysis reports
- Data model & schema developed
- Geological specification and **vocabulary** developed (*allows progress towards harmonisation*)
- Implementation and use of multilingual vocabulary services
- Metadata profile produced, accessible through a catalogalog
- Portrayal rules (common legends) developed
- Implementation of “OneG-E compliant” WMS and WFS for every country
- Multilingual Portal developed
- High resolution and cross-border delivery services tested
- ... and
- ... common licensing agreement for accessing 1:1M map data !

# The OneGeology-Europe portal



The screenshot displays the OneGeology-Europe web application interface. At the top left is the ONE Geology Europe logo. To the right, there is a language selection menu showing various European flags. Below the logo are two tabs: "Search" and "Map viewer". The "Map viewer" tab is active, showing a map of Europe with a geological overlay. The map is color-coded by lithology, with a scale bar at the bottom indicating 1200 km and a scale of 1:25,000,000. The SRS is WGS 84, and the coordinates are X: 7.88 and Y: 59.92. On the left side, there is a "Layers" panel with the following options:

- Country Outlines/Political boundaries
- 1GE - 1M:M Harmonized Geological Map
- Surface
- Move Up | Move Down
- Modify Opacity
- Lithology
- Remove Layer
- View metadata
- Display legend
- Download data
- Create a custom map
- Area Displayed
- Selected area informations

At the bottom of the layers panel, there is a red "X" icon and the text "Remove all layers".

A single virtual harmonised layer served by 20 countries



# Common legends („Portrayal Rules“)



OneGeology-Europe: WP3 Portrayal  
**Age: RGB Colour Code**  
Colours according to the Geological Time Scale 2006, International Commission of Stratigraphy, with the addition of 27 newly defined colours for the proposed new European Proterozoic Epochs

Period	Epoch	Age	Color	
Phanerozoic	Cenozoic	Quaternary	Yellow	
		Tertiary	Quaternary	Yellow
			Pliocene	Yellow
			Pleistocene	Yellow
		Mesozoic	Cretaceous	Yellow
			Jurassic	Yellow
			Triassic	Yellow
			Permian	Yellow
			Carboniferous	Yellow
			Devonian	Yellow
Silurian	Yellow			
Phanerozoic	Palaeozoic	Permian	Orange	
		Carboniferous	Orange	
		Devonian	Orange	
		Silurian	Orange	
		Ordovician	Orange	
		Silurian	Orange	
		Ordovician	Orange	
		Devonian	Orange	
		Carboniferous	Orange	
		Permian	Orange	
Phanerozoic	Proterozoic	Proterozoic	Green	
		Proterozoic	Green	
		Proterozoic	Green	
		Proterozoic	Green	
		Proterozoic	Green	
		Proterozoic	Green	
		Proterozoic	Green	
		Proterozoic	Green	
		Proterozoic	Green	
		Proterozoic	Green	

## OneGeology-Europe - Portrayal of Contacts and Structures

### 1. Contact Type










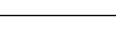





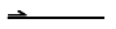
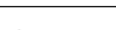
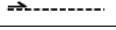


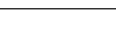
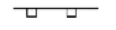

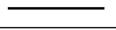
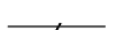
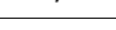

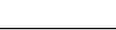

**Table 1:** The OneGeology-Europe contact type terms (mainly after CGWGeoSciML)

OneGeology-Europe ID	OneGeology-Europe Term	Descriptive terms	Symbol	R	G	B
dt1	Contact	Geological boundary Geological boundary, inferred		195	195	195
dt1.1.1	Volcanic subsidence zone boundary	Dotted line on the inside of the structure. (For cartographers: The line should be drawn so that the dashed line is to the right in the drawing direction)		255	0	0

OneGeology-Europe: WP3 Portrayal  
**Lithology: RGB Colour Code**

Group	Rock Type	Color
Igneous intrusives (53.0, 217)	Granite	Yellow
	Diabase	Yellow
	Andesite	Yellow
	Basalt	Yellow
	Trachyte	Yellow
	Andesite	Yellow
	Basalt	Yellow
	Trachyte	Yellow
	Andesite	Yellow
	Basalt	Yellow
Igneous extrusives (163.0, 217)	Basalt	Yellow
	Trachyte	Yellow
	Andesite	Yellow
	Basalt	Yellow
	Trachyte	Yellow
	Andesite	Yellow
	Basalt	Yellow
	Trachyte	Yellow
	Andesite	Yellow
	Basalt	Yellow
Sedimentary (265.2, 163)	Sandstone	Yellow
	Siltstone	Yellow
	Shale	Yellow
	Limestone	Yellow
	Dolomite	Yellow
	Marl	Yellow
	Claystone	Yellow
	Sandstone	Yellow
	Siltstone	Yellow
	Shale	Yellow
Metamorphic (61.1, 150.6)	Gneiss	Yellow
	Schist	Yellow
	Quartzite	Yellow
	Amphibolite	Yellow
	Marble	Yellow
	Schist	Yellow
	Quartzite	Yellow
	Amphibolite	Yellow
	Marble	Yellow
	Schist	Yellow

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				0	0	0
				0	0	0
				255	0	0
				0	0	0
				0	0	0
				0	0	0
				0	0	0
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				0	0	0
				0	0	0
				0	0	0
				0	0	0
				0	0	0
				0	0	0

# Metadata

 Metadata of the discovered datasets and services

× 1GE GEUS 1M surface Geologic Unit

- **Server :** GEUS - Danmark og Gronland

- **Online resource :** <http://geusjuptest.geus.dk/oneGEconnector/>


- **Layer name :** 1GE - 1M:M Harmonized Geological Map

- **Abstract :** DNK GEUS 1:200.000 M Geology

- **Access constraints :** Data paa denne service ejes af De Nationale Geologiske Undersoegelser for Danmark og Groenland - GEUS. Dette indebaerer at alle rettigheder, inklussiv men ikke begrænset til copyrights, patenter og andre intellektuelle rettigheder tilhoerer GEUS. Ingen rettigheder maa overfoeres til en bruger. GEUS frasiger sig ethvert ansvar omkring datakvalitet og data brugbarhed for brugeren. GEUS fralaegger sig derfor ethvert ansvar i forhold til eventuelle konsekvenser der foelger brugen af data, uafhaengig af om eventuelle problemer er en foelge af fejlagtige eller manglende data, eller brugerens brug af data.

- **Descriptive keywords :**

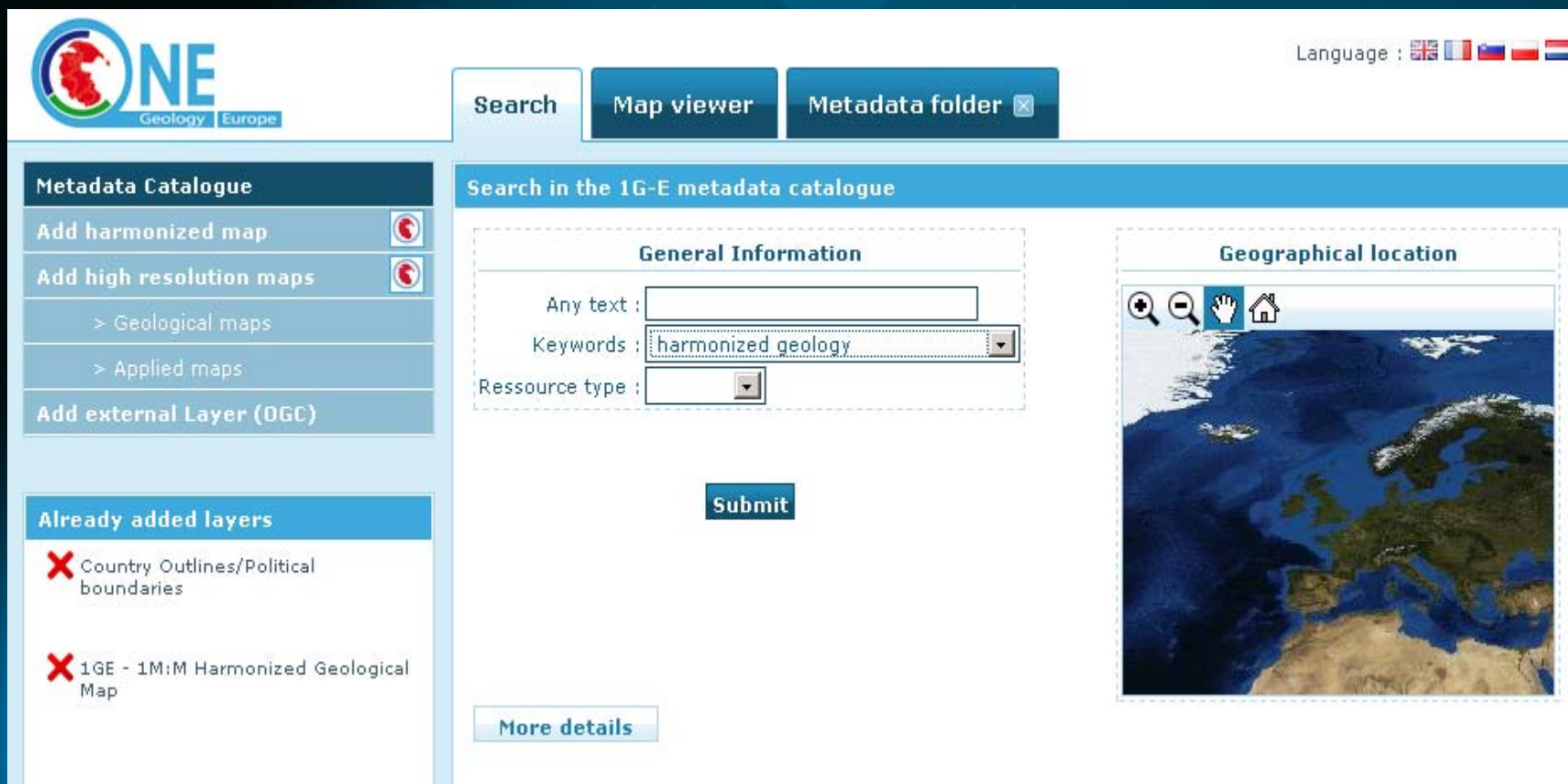
- **Extent (lat lon bounding box) :**

	North	
	58.15	
West		East
3.1		16.5

**Legend**



# Simple search



The screenshot shows the ONE Geology Europe search interface. At the top left is the ONE Geology Europe logo. To the right, there is a language selection menu with flags for UK, France, Romania, Hungary, and Netherlands. Below the logo are three tabs: 'Search' (selected), 'Map viewer', and 'Metadata folder'. The main content area is titled 'Search in the 1G-E metadata catalogue' and is divided into two sections: 'General Information' and 'Geographical location'. The 'General Information' section contains three input fields: 'Any text' (empty), 'Keywords' (containing 'harmonized geology'), and 'Resource type' (empty). A 'Submit' button is located below these fields. The 'Geographical location' section features a map of Europe with a blue overlay, and navigation icons for zoom in, zoom out, pan, and home. On the left side of the interface, there are two panels: 'Metadata Catalogue' with options to 'Add harmonized map', 'Add high resolution maps' (with sub-options for Geological and Applied maps), and 'Add external Layer (DGC)'; and 'Already added layers' with two items marked with a red 'X': 'Country Outlines/Political boundaries' and '1GE - 1M:M Harmonized Geological Map'. A 'More details' button is located at the bottom of the search form.

# Search results

Search

Map viewer

Metadata folder 

Metadata Catalogue

> Search results

Add harmonized map 

Add high resolution maps 

> Geological maps

> Applied maps

Add external Layer (OGC)

Already added layers

 Country Outlines/Political boundaries

 1GE - 1M:M Harmonized Geological Map

Search in the 1G-E metadata catalogue

Search results : Page [1](#) [2](#) [3](#) [4](#)

**[dataset]**



BRGM [**France**] \* Digital geological map of France at 1:1Million (6th edition - 2003)

**[dataset]**



Polish Geological Institute - National Research Institute [**Polska**] \* Geological map of Poland in 1:1 000 000 scale

**[service]**



Geological Survey of Slovenia [**Slovenia**] \* GeoZS superficial geology (OGC:WMS)

**[dataset]**



British Geological Survey [**UK**] \* Digital Geological Map Data of Great Britain - 625k (DiGMapUK-625) Bedrock

**[service]**



Federal Institute for Geosciences and Natural Resources [] \* Airborne geophysics in the Cuxhaven area (OGC:WMS)

# Use URL to access the service

## ✗ Geological map of Poland in 1:1 000 000 scale

### More details

Metadata from the metadata catalog

**- Abstract :** Geological map of Poland in 1:1 000 000 was done in the process of verification of geological map of Poland in 1:500 000 scale. Geological information was generalized to 1:1 000 000 scale in accordance with a knowledge about geology of Poland and assumptions of international initiative OneGeology. It's required revision of stratigraphy, lithology, preparing a new method of marking small polygons and standards implementation e.g. GeoSciML. Geological map of Poland is available on map portals, e.g. Geoportal IKAR, OneGeology Portal or Google Earth as a part of Geological map of World at 1:1 000 000 scale

**- Ressource type :** dataset **- Language :** pol, eng

**- Online resource :** <http://ikar2.pgi.gov.pl/services/MGP1MLN/MapServer/WMS/Server>

**- Reference** EPSG 4326

### System :

**- Descriptive keywords :** Geology, ONEGEOLOGY, GEOLOGY/Stratigraphy, GEOLOGY/Petrology/Lithology, ONEGEOLOGY/OneGeology-Europe,

ONEGEOLOGY/OneGeology-Europe/harmonized geology

### Access


#### constraints :

**- Use Limitation :**

**- Access** intellectualPropertyRights

# Get Information on a layer

**GetFeature Info**

1GE - 1M:M Harmonized Geological Map 

[+> Memorize in the Data Folder](#) [+>View the GeoSciML response](#)

Name: *Marls with interbedded shales and sandstones; arenaceous, arenaceous-volcaniclastic and arenaceous-pelitic-marly turbidites*  
 GEO1MDB\_21

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Age: **Oligocene** [Oligocene .. Burdigalian] Process: **Turbidity current deposition** | Environment: **urn:cgi:classifer:CGI:EventEnvironment:201001:basin\_plane\_setting**

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**Lithology**

**Impure limestone** ( predominant )  
**Shale** ( subordinate )  
**Sandstone** ( subordinate )  
**Tuffite** ( subordinate )  
 ( subordinate )

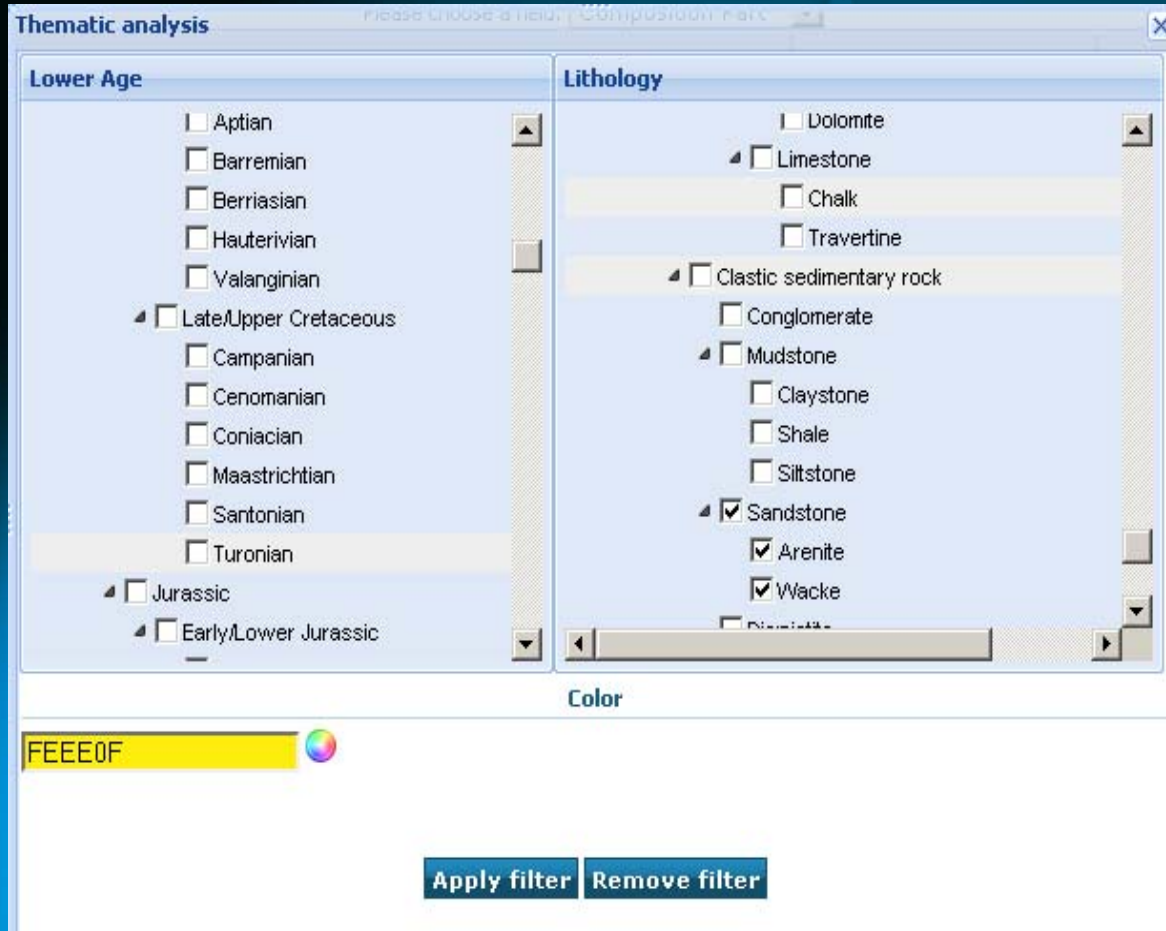
**Notation** : 1.2.2.1.3  
**Definition** : Clastic sedimentary rock in which less than 30 percent of particles are greater than 2 mm in diameter (gravel) and the sand to mud ratio is at least 1.  
**History Note** : SLTTs 2004; Neuendorf et al. 2005; particle size from Wentworth grade scale.  
**Alternative Label** : Clastic sandstone

Name: GEO1M... *ies and conglomerates*  
 Age: **Late/U**... **ation** | Environment:  
**Cretaceous**... **onment:201001:basin\_plane\_setting**

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**Impure carbonate sedimentary rock** ( predominant )  
**Sandstone** ( subordinate )

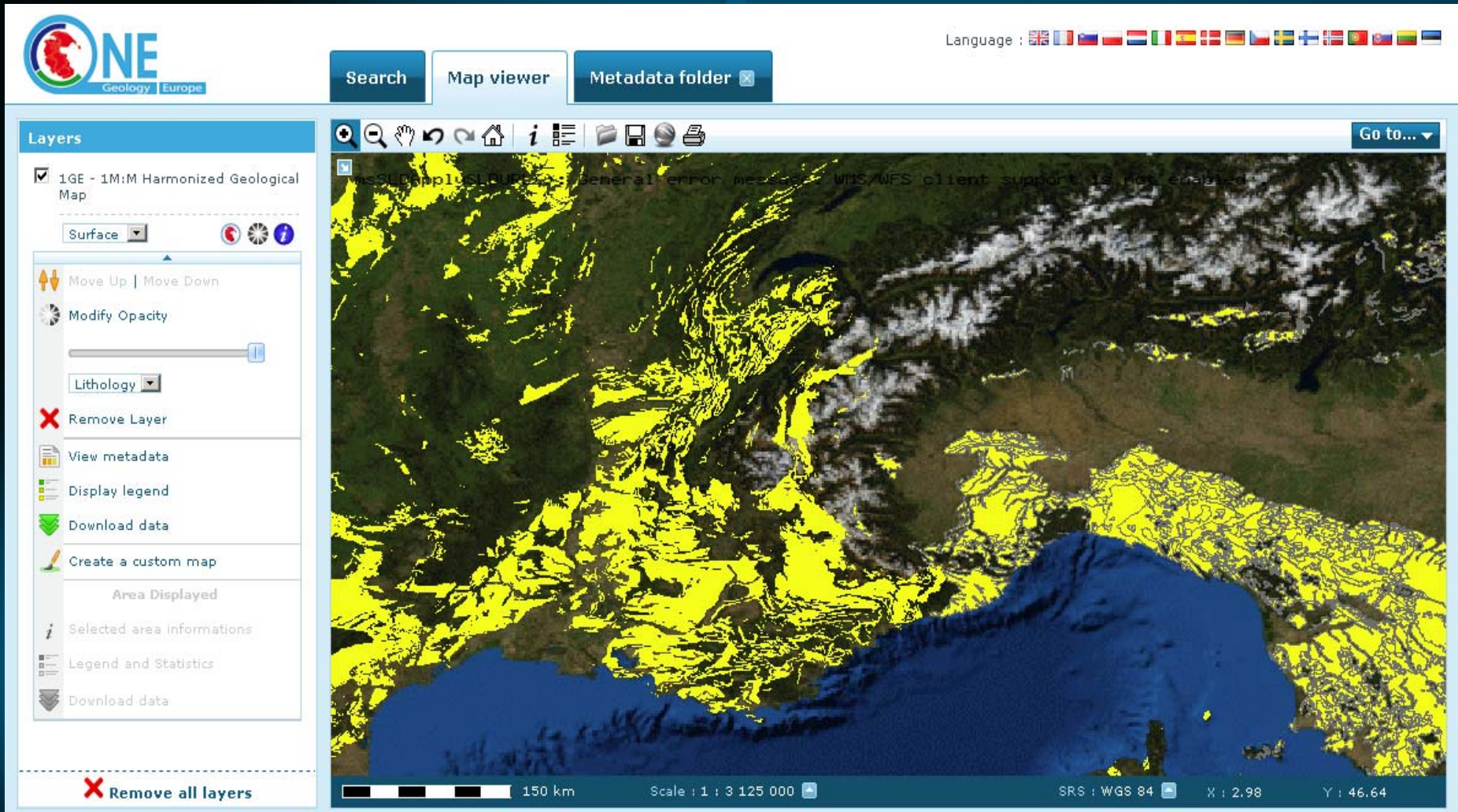
# Custom map on lithology and/or age



Create new maps in real time from 20 different maps sharing common data model and vocabularies

To create a common style (geologic units with sandstone) sent to all services.

# Custom map



The screenshot displays the ONE Geology Europe web application interface. At the top left is the ONE Geology Europe logo. To the right, there is a language selection menu showing various European flags. Below the logo are three tabs: "Search", "Map viewer", and "Metadata folder". The main interface is divided into a left sidebar and a central map area. The sidebar, titled "Layers", shows a checked layer named "1GE - 1M:M Harmonized Geological Map". Below this, there are controls for "Surface" (set to "Surface"), "Move Up | Move Down", "Modify Opacity" (with a slider), "Lithology" (set to "Lithology"), and a "Remove Layer" button. Further down, there are buttons for "View metadata", "Display legend", "Download data", and "Create a custom map". At the bottom of the sidebar, there are sections for "Area Displayed", "Selected area informations", "Legend and Statistics", and another "Download data" button. A red "X" icon and the text "Remove all layers" are at the very bottom of the sidebar. The central map area shows a 3D topographic map of a region, with geological units overlaid. A large area of the map is highlighted in yellow, representing sandstone units. The map includes a toolbar with navigation icons (pan, zoom, home, etc.), a scale bar (150 km), and a scale of 1:3 125 000. The SRS is WGS 84, and the coordinates are X: 2,98 and Y: 46,64. A "Go to..." button is in the top right corner of the map area. A small error message is visible at the top of the map: "msSLDApplet: SURF: General error message: WMS/WFS client support is not enabled".


















**Geologic units with sandstone (colour: yellow)**



# Legend and statistics on bounding box

Legend and statistics on BBOX


















Please choose a field: Composition Part

Symbol	Lithology	Proportion	Count
	Eclogite		
	Compound material		
	Mica schist		
	Gneiss		
	Sand		
	Conglomerate		
	Breccia		
	Limestone		
	Conglomerate		
	Clay		
	Clay		
	Tuffite		
	Igneous material		
	Schist		
	Quartzite		
	Gabbro		
	Paragneiss		

Legend and statistics on BBOX

Please choose a field: Composition Part

Symbol	Lithology	Proportion	Count
	eklogiitti	vähäinen	1
	seosaines	vähäinen	2
	killeliuske	vallitseva	5
	gneissi	vähäinen	7
	hiekkä	vallitseva	1
	konglomeraatti	vallitseva	22
	breksia	vähäinen	18
	kalkkikivi	vähäinen	119
	konglomeraatti	vähäinen	83
	savi	vähäinen	21
	savi	vallitseva	2
	Tuffiit	vähäinen	4
	magmaattinen aines	vallitseva	1
	liuske	vähäinen	133
	kvartsiitti	vähäinen	12
	gabro	vähäinen	1
	hiekkakivi	vähäinen	114

Contextual multilingual legends and statistics merging different map sources

# Download data

**Download data**

**Download License Agreement**

You must agree to the following terms to proceed :

**OneGeology-Europe**

**Conditions for downloading of ~1:1 million scale surface and bedrock geological map data**

**Allowed use**

The ~1:1 million scale data is available for download in GeoSciML and ESRI ShapeFile formats from the OneGeology-Europe portal free of charge, without any restrictions, for any legitimate use, including public, private and commercial use.

**IPR**

Any and all Intellectual Property Rights in the ~1:1 million scale geological data provided by the rightholders through the OneGeology-Europe portal are and shall remain the exclusive property of their respective rightholder (which will normally be the national geological

Accept

**Format choice**

GeoSciML  Shapefile

**Download data**

Common License agreement

Download in GeoSciML or in shapefile

# Vocabularies client application

CGI / GeoSciML vocabularies client | Version of vocabularies: CGI 201001

Browse vocabulary, or search by term. View its parents, definition and properties. Translations will be available soon.  
Client and [web services](#) developed and hosted by BRGM - 2010

<GeoSciML/>

**Navigation & Search**

Available vocabularies

- AlterationType201001.xml
- ContactType201001.xml
- EventEnvironment201001.xml
- EventProcess201001.xml
- FaultType201001.xml
- FeatureObservationMethod201001.xml
- FoliationType201001.xml
- GeologicUnitMorphology201001.xml
- LineationType201001.xml
- MappedFeatureObservationMethod201001.xml
- MetamorphicFacies201001.xml
- MetamorphicGrade201001.xml
- ProportionTerm201001.xml
- SimpleLithology201001.xml

**Concept**

**Igneous rock**

- Broader terms
  - Igneous material
  - Rock
- Narrower terms
  - Acidic igneous rock
  - Basic igneous rock
  - Doleritic rock
  - Exotic composition igneous rock
  - Fine grained igneous rock
  - Fragmental igneous rock
  - Glass rich igneous rock
  - Intermediate composition igneous rock
  - Phaneritic igneous rock
  - Porphyry
  - Ultrabasic igneous rock
  - Ultramafic igneous rock

**Concept properties**


urn:cgi:classifer:CGI:SimpleLithology:201001:igneous\_rock


Property	Value
source	Neuendorf et al 2005

**Definition**

*rock formed as a result of igneous processes, for example intrusion and cooling of magma in the crust, or volcanic eruption.*

# High resolution maps



Language : 


**Search**


**Map viewer**

**Metadata folder**


### Geological maps


Explanation text of High resolution maps, to be filled by WP9


[United Kingdom - [BGS](#)]





1:50k DiGMapGB data covering the map sheets of Great Britain.



[Belgium - [GSB](#)]




The Tertiary geology map of Flanders.


[Netherland - [TNO](#)]






[France - [BRGM](#)]



#### Metadata Catalogue

> Search results

Add harmonized map 

Add high resolution maps 

> Geological maps

> Applied maps

Add external Layer (OGC)

---

#### Already added layers

✗

Country Outlines/Political boundaries

✗

1GE - 1M:M Harmonized Geological Map

# What did we achieve ?

- Capacity building :
  - Sharing high degree of technical expertise
  - Common understanding on interoperability / harmonisation issues
  - *new way of thinking*
- Expected scientific and technical results
  - Methodology for harmonisation and production of our “fundamental” geological information (geological maps)
  - Done at 1:1M scale, tested for other scales
  - *a prerequisite for further applied geology services*

# OneGeology-Europe sustainability ?

- Keep the momentum...
  - WMS and WFS maintained by national geological surveys
  - Maintenance of portal (and monitoring of services) and catalogue funded by EuroGeoSurveys
  - Maintenance of the vocabularies (and associated services)
  - Provide components to OneGeology global (for implementation, adaptation...)
  - Signature of an agreement with the European Environment Agency

# What next ?

- We have an infrastructure
  - populate it (off shore geological maps, urban geohazards,...)
  - develop “services / uses” of on line data
- Extension to other « INSPIRE » related data (applied maps, derived products, 3D,...) ?
- Production of operational / reliable services
- Funding model...

*INSPIRE is not the end of the story... we must continue to be proactive in the development of standards for data and information products*

Thank you for your attention

*f.robida@brgm.fr*