## GEOTHERMAL ERA-NET: WP3: Towards a European Geothermal Database



### WP3

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### WP3: Towards a European Geothermal Information Platform (EGIP)

was WP3: Towards a European Geothermal Database

#### **Objectives**

- Geothermal ERA-NET aims to work on setting the standard on what geothermal information to collect for Europe, proposing and describing the <u>structure</u> of a European Geothermal Information Platform, to have a reference that may be followed at national level and to put the base for a common <u>Data Model</u> to share information among European countries.
- Within Geothermal ERA-NET we also aim to define general rules for managing the <u>catalogued</u> data and implement <u>services</u> to provide the information of the European Geothermal Information Platform following INSPIRE specification.



## WP3: Towards a European Geothermal Information Platform

#### Task 3.1 Preparation of the scientific and technical activity

 Preparation activities, including scientific and technical programme, two specialized workshop on European Geothermal Database, organization of addictional meeting

#### Task 3.2 State of the art and needs

- Questionnaire, data inventory, needs and gaps, State of the art report

### Task 3.3 Preparation of a feasibility study

- Discussion on feasibility, INSPIRE inplication on EGIP, budget estimation, feasibility study

#### Task 3.4 Following-up the implementation

 The preliminary design will be used to prepare a call for proposal to implement the European Geothermal Information Platform through one or more pilot area(s)

Afternoon discussion



### WP3: Towards a European Geothermal Database

#### Task 3.1 Preparation of the scientific and technical activity

- Preparation of the scientific and **technical programme** of general meetings (Launching and Final Conferences, etc.),
- Organization of two specialized **workshop** dedicated to the preparation of the European Geothermal Database,
- Organization of additional **meetings** at regular intervals in order to update the scientific and technical programme.



### WP3: Towards a European Geothermal Database

Task 3.2 State of the art and needs

Complementing WP2

- Data inventory
- Data sharing **tools inventory**
- Needs&gaps
- Organize a specialized **workshop**: "European Geothermal Database: state of the art and needs".



### WP3: Towards a European Geothermal Database

#### Task 3.3 Preparation of a feasibility study

Based on Task 3.2 results, a preliminary design for a **platform** the European scale will be proposed. It will take into account the best practices of existing tools and will propose solutions to meet identified needs.

- Close interaction with national programmes (resource data)
- Accordance with the **INSPIRE** European directive. INSPIRE's One-Geology portal and Interreg IV as example.
- **Budget** estimation to be included
- Discussion in a specialized **workshop**: "European Geothermal Database: Feasibility study".



### WP3: Towards a European Geothermal Database

#### Task 3.4 Following-up the implementation

The preliminary design will be used to prepare a **call for proposal** to implement the European Geothermal **platform** through one or more **pilot area**(s).

The choice of the field, of the data, and the demonstration scenario

will be crucial to demonstrate the usefulness and the capabilities of the European geothermal database.



# WP3: Deliverable

Ν.	title	Person/ months	Nature	Dissemination level	Delivery Date
D3.1	Report on the state of the art and the needs in regarding geothermal data and existing tools	1	R	RE	April 2013
D3.2	Feasibility study for a European Geothermal Database	1	R	PU	October 2013
D3.3	Report on the implementation of the European Geothermal Database	1	R	RE	45 January 2016



### WP3: Milestones

Ν.	title	Delivery Date
8	Database workshop1: European Geothermal Database State of the art and needs	March 2013
9	Database workshop 2: European Geothermal Database Feasibility study	June2013



### GEOTHERMAL ERA NET: WP3: Towards a European Geothermal Database



# Task 3.2 State of the art D3.1

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### WP3: Towards a European Geothermal Database

### Phase 1: State of the Art

#### Questionnaire structure

- General Database Context information
- Data Master List
  - Scientific and technical aspects
  - Social acceptance (including environmental issues)
  - Code (thesaurus, glossary, lexicon, reporting code)
  - Skills & employees, energy needs
  - Research R&D
  - Training and education
  - Regulatory aspects
  - Economics (fund, risks&insurance)
  - Other (hints)
- Database Application to develop
- Procedures for data update and data management



### Towards a Geothermal European Information Platform EGIP – **state of the art**

### Geothermal knowledge information

#### International DB



New IRENA (renewable energy database), etc...

#### National DB



Geothopica – Italian National Geothermal Database, etc...

#### Project DB



Geoelect, geoDH, ...



Database







# Towards a Geothermal European Information Platform EGIP – **content**



### State of the Art: Data availability



### State of the Art: Data management



\*Countries have different kind of data organization

### State of the Art Data availability



Y axis indicates the presence of documents for each topic, except for 2.3 where the value 1 means the existence of the geothermal code



### State of the Art Data: availability

### •Map of data distribution

Note:

> 80%

Geot

ERA-NET

Short term

feasibility

2.1 Scientific and technical aspects	% consortium
Temperature data in the subsurface (e.g. oil and gas borehole BHT/DST).	8
Temperature maps at depth (Available depth?) 1 / 2 / 3 km	8
Surface heat flow measurements and map	7
Heat flow measurements and map at depth	4
Thermal spring analyses (physical and chemical, e.g., temperatures, pH, chemical elements, geothermometers)	6
Geothermal reservoir temperature in high enthalpy geothermal fields	6
Any other reservoir information (e.g. pressure, production level depth, flow range, fluid characteristic, enthalpy).	7
Published temperature model interpretation (e.g. regional heat flow, local effects due to meteoric effects)	7
Basin layout and sediment-basement interface depth	7
Outlines of granitic formations	4
Geothermal and oil&gas wells masterlog (including litho-stratigraphy, wells technical aspects,	
geophysics logs)	6
Geophysical survey (e.g. seismic cross-sections, MT survey, geoelectrical survey)	8
Fault mapping, Tertiary and Quaternary fault systems	7
Recorded seismicity	7
Information regarding geographical restricted areas for geothermal (consider mining, oil exploration and/or exploitation, CCS, nuclear storage, spa's, interference with drinking water, population density,	
natural parks, high seismicity areas, etc.)	6
Exploration and production licenses and (projected) power production	7
Raster maps of transmissivity (map coverage % of country/region)	5
Porosity – Permeability measurements or poro-perm relationships and poro/depth relationship	7
Exploration data on particular data prospective resources	6
Geothermal plant location, installed capacity (MW), running capacity (MW) and produced energy in	
Dire year (wwwi/year), typology, status, plant owner, manufacturer, geothermal field belonging.	ť
Direct use of neat. location, typology, installed capacity (MWV) and produced energy in one year (T Moor)	
i u/ year j	

### State of the Art Data: availability

### •Map of data distribution

2.3 Code	% consortium
Geothermal code and/or thesaurus and/or a glossary in your body or in your country	44
2.4 Skills & employees, energy needs	
Official number of employees in the field of geothermal? (e.g. institutional body, privat company,)	te 56
List of skills required in the field of geothermal	44
Surveys on energy needs and coverage by geothermal uses? (e.g. maps,)	67
2.5 Research R&D	
Geothermal projects running, completed and foreseen	100
Geothermal projects considered necessary on specific topics	89
Geothermal national roadmap	89
2.6 Training and education	
Geothermal training courses present?	78
If ves, which level (e.g. University, PhD, Master, professional bodies, specialization)?	10
Training courses details (e.g., location, schedule)	78
Training courses average attendance	44



Note:

> 80%

Short term feasibility

### State of the Art Data: availability

### •Map of data distribution

Note: Short term feasibility

> 80%

2.2 Social acceptance (including environmental issues)	% consortium
Studies and reports on the social acceptance of geothermal energy	
Environmental impact laws	1
Environmental pressure factor list	
Monitoring network data	
If yes, which are the tracked parameters?	
2.7 Regulatory aspects	
Rules of licencing (exploration/exploitation)	
Legal condition for grid access	
Any other issue you consider important to list and retrieve?	
2.8 Economics	
Insurance covering the geothermal project risks (e.g. deep drilling wells)?	
Royalities & taxes, support scheme (feed-in tariffs, grants,)	



# State of the Art Needs and gaps

Majority of the crucial issues (I):

- to elaborate a common database gathering info from various sources (wells, plants)
- to define tools to manage the exploited aquifers and to assess the possibility of new operations
- to harmonize services and data management following a precise protocol, which should also define data content and format
- to be conform to INSPIRE



# State of the Art Needs and gaps

Majority of the crucial issues (II):

- to provide tools helping to select potentially interesting areas also taking into account other factors beside geothermal potential, e.g., energy demand, potential coverage of different kind of energy demand with respect to geothermal heat and power potential supply, social aspects
- registration system of geothermal and cold water wells
- tools to manage regulatory forms (restriction maps, on-line permissions and concessions request forms)
- Integrated tool to manage all data types and provide synthetic and aggregated information







### Task 3.3 Feasibility Study D3.2

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# Way forward

D3.1

#### • .....

• 30 April 2013 final report

### D3.2

- 03 June 2013 Feasibility Technical RoundTable
- 4<sup>th</sup> ERANET meeting Draft overview of the D3.2 contents
- 30 September 2013 preparation of draft report
- 15 October 2013 comments to draft
- 30 October 2013 final report

D3.3

•



### Towards a European Geothermal Database

How to get EGIP: towards feasibility

- 1. work on the **data specification** (including both the structured and the unstructured data)
- Define three importance levels of information for our geothermal community starting from the master data list proposed in two questionnaires e.g., Education/training – Where are located geothermal courses in my country... at national level
- 3. Define "**European product**(s)" What to deliver at the European level, gathering national data ex.: Potential type - geothermal gradient, temperature (compulsory in INSPIRE) e.g.: EUROSTAT
- 4. Define EGIP basic **functionality**, e.g. **Tables** data, **Reports**, **Maps**, **Charts**, documentation **Search** and **Download**, others???



### Aims of EGIP idea:

- i. reduce the information fragmentation
- ii. reduce the effort for data provision
- iii. reduce risk in geothermal (economical aspects)
- iv. arise awareness of geothermal energy by providing an overview of its
- i. application at European scale
- v. increase focus and investment in geothermal energy

#### Low priorities, to be

developed in the future:

- Project list with key figures (possible lower limit)
- Project under planning and construction
- Research projects
- Educational activities



### High priorities:

- Public administrations (roles, regulation, support schemes)
- Industry business
- Education and research
- Funding organizations
- Info on existing production/exploitation for geothermal
- Information of potential (temperature/depth, ...)
- Energy market structure
- Energy demand and supply
- National energy strategy (2020 goals)

### Feasibility stage 1 list of data

# <u>Contents</u>

WP3 questionnaire surveyed 42 different kind of geothermal information

Data	Structured	Sub-Section	Feasibility stage
Temperature maps at depth (Available depth?) 1 / 2 / 3 km	Y	Scientific and technical aspects	1
Surface heat flow measurements and map	Y	Scientific and technical aspects	1
Environmental impact laws	Ν	Social acceptance (including environmental issues)	1
Geothermal national roadmap	N	Research R&D	1
list of Education & Research institutes'*		Training and education	1
Rules of licencing (exploration/exploitation)	N	Regulatory aspects	1
Legal condition for grid access	N	Regulatory aspects	1
Insurance covering the geothermal project risks (e.g. deep drilling wells)?	N	support schemes	1
Royalities & taxes, support scheme (feed-in tariffs, grants,)	N	support schemes	1
Industry list*	N	Deployment	1



\* Not included in the WP3 questionnaire

## Toward the feasibility

### How to get EGIP

#### <u>Contents</u> organization





### **Design Data Model**

Length

Field

#### Structured data – included in the feasibility first stage

<u>Contents:</u> data model



#### Structured

Name layer: Description: Layer cod: Typology: Raster / Vector / Grid If Vector, Geometry: Point / Line / Area

		.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
POINT_ID	5	I		Unique and not null identity number
TYPF	4	1		1000 = fumaroles
		·		1010 = manifestation of gas
				1020 = manifestation of water and gas
				2000 = well
				2010 = exploration well
				2020 = thermal gradient well
				2030 = prody on well
				2040 = dome orehole
				3000 p
				3(2) = 1 spring
				-12 n. ral spring
				D J0 sinjection well
			2	060 = monitoring well
			15	00 =
				9999 = unknown
TYPOLOGY	1		25	0 = missing data
				1 = sure
				2 = deducted
				3 = unsure
				4 =
				9 = not applicable/not classifiable
STATUS	6	1		0 = missing data
				1000 = production
				2000 = test
				3000 = temporary closed
				4000 =
				9999 = not applicable
OTHERS				

Type\* Decimal Note



NOTE: \*Type can be (I= Integer, C=Character, F=Float)

The spatial data will be provided with INSIPRE metadata definition, based on ISO19115 and ISO19119

### Design Data Model

Un-structured data – list of documents included in the feasibility first stage



<u>Contents:</u> <u>catalogue</u>





### Towards a Geothermal European Information Platform EGIP – *functionalities*

**EGIP** tools have to guarantee a 360° data browsing (e.g., browsing from а catalogue to а document, from а document to a tabled info or spatial data) and allowing a deep into the survey geothermal knowledge.







For the services:

Geot

ERA-NET

- View and access/download services are well specified in INSPIRE
- Process services have to be compliant with a general framework only

For the common data model to be used by the access, download and process services:

- to specify this data model : input from existing DB, and INSPIRE requirements
- Participation to Specification Working Groups for standardisation (INSPIRE and others)
- Development of vocabularies (code-lists)

### Towards a Geothermal European Information Platform EGIP – *INSPIRE benefits*

- Interoperability: Retrieve, view and access information from other providers (via wms, e.g., temperature maps @ depth, protected areas, ...)
- Harmonization of the geothermal domain at the European level
- European Commission favours and finances such harmonization in some European projects
- Investment for harmonizing at national level

#### **INSPIRE compliant**

• Not a single Database (DB) gathering all the information from the countries

#### but



A way to upscale national knowledge at European scale where the information belongs to the countries and is stored in national DB

# D3.2 Feasibility Study

**Table of contents** 

- > 1 Introduction: Roadmap towards three stages of development
- > 2 Organization of the documents collected (from the state of the art) "Stage zero"
- > 3 Stages definition and data organisation
- 4 Data Model (first stage):
  - 4.1 Entity attributes and relations descriptions
  - 4.2 Catalogue descriptions
- 5 Description of functionalities (first stage)
- **6** INSPIRE UML schemas related to EGIP DATA MODEL (BRGM contribution)
- 7 Budget estimation
- APPENDIX 1 Stage 'zero' catalogue
- > APPENDIX 2 Metadata schema for dataset and services
- > APPENDIX 3 technical document for EGIP implementation (BRGM contribution)





# WP3: Towards a European Geothermal Database

### Task 3.4 Following-up the implementation D3.3

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## **ERANET WP3 roadmap**

- D3.1: done (Task 3.2)
- Task 3.3 (end of October 2013):
  - 3 June technical round table on EGIP feasibility:
    - List of date belonging three stages (from the state of the art)
    - Functionalities
    - Cataloguing un-structured data (documents)
    - INSPIRE BRGM contribution
  - D3.2 end of October 2013:

#### Task 3.4

- Medium stage list data model
- Implementation of pilot project (portal includes date from the short term stage data list and functionalities) possibly in countries where a joint activities is now running on datacenter topic (end of may 2014)
- D3.3 (Report on the implementation of the European Geothermal Information Platform) - Jan 2016
   Afternoon discussion



### **Final remarks**

Not only...

✓ Finalization of the data model for EGIP compliant with INSPIRE

#### ✓ A few Web services

- □ Visualize data: Web Map Services (WMS)
- □ Access data: Web Feature Services (WFS)
- □ Process data: Web Processing Services (WPS)
- $\checkmark$  A pilot accessing a few countries to demonstrate the implementation

...<u>but also</u>:

- ✓ Contributing to the INSPIRE working group ?
  → Next Technical Guideline 2014
- Participate and influence specifications and implementations for the geothermal sector



### ERANET WP3 Roadmap

Following up implementation and corresponding D3.3 "Report on the implementation of the European Geothermal Information Platform"

#### ✓ D3.3 due for January 2016 (month 45)

#### <u>Proposal</u>:

- Implementation of a pilot EGIP (data and functionalities first stage) in countries having running projects regarding data centres implementation (Joint activities)
- Second stage data model and functionalities
- Call for proposal for activities on a further EGIP realisation (WP7) (may be useful especially in countries lacking centralized data centres)
  - Second stage EGIP implementation
  - Third stage data model and functionalities
  - Third stage implementation ??? (time may be not sufficient)



### **ERANET WP3** Discussion on INSPIRE Call for Expert

#### http://inspire.ec.europa.eu/index.cfm/pageid/5160

#### The INSPIRE Maintenance and Implementation Framework (MIF)

#### INSPIRE Maintenance and Implementation Group (MIG) is a part of MIF

MIG is a commission of expert with the aims of the experience exchange and good practice between the Member States to identify and give advice about implementation and maintenance issues

#### Part of MIG is the **Pool of experts** drawn from the stakeholder community

- Registration are possible from 8<sup>th</sup> of July 2013
  - Pool of experts on INSPIRE implementation and maintenance, the call is open to all individuals with a high level of expertise in one or several of the aspects\* relevant for INSPIRE implementation and maintenance
  - The experts should provide ad-hoc input to discussions related to INSPIRE implementation and/or participate in sub-groups set up by the MIG to address specific maintenance or implementation support tasks.



\*see next slide

### Pool of experts: expertise I

#### <u>Metadata</u>

- INSPIRE Technical Guidelines
- Implementation in the Member States
- Conformance testing
- metadata standards (e.g. ISO 19115, Dublin core, W3C DCAT)



#### Interoperability of spatial data sets and services

- INSPIRE Technical Guidelines Data specification framework documents (D2.5, D2.6, D2.7, D2.9)
- INSPIRE Technical Guidelines INSPIRE data specifications and base models (D2.8.x, D.2.10.x)
- Implementation in the Member States
- Conceptual data modelling / UML, OCL
- Encoding standards (e.g. GML, RDF)
- Observations & measurements
- Portrayal
- Coverages
- Data quality
- Data transformation, E TL
- XML schemas
- Identifiers, URIs, Linked Data
- Conformance testing. Abstract Test Suites
- Thematic knowledge related to one or more
  INSPIRE themes

### Pool of experts: expertise II

#### Network services & spatial data services

- INSPIRE Technical Guidelines
- Implementation in the Member States
- View services
- Discovery services
- Download services
- Transformation services
- Invoke services & spatial data services
- Service architecture
- XML schemas
- Web service
- standards (e.g. OGC , ISO, OASIS, W3C)
- Web standards (e.g. XML, Atom, OpenSearch )
- Performance requirements, service monitoring
- Authentication, authorisation, accounting (AAA)
- Digital rights management
- Conformance testing

#### Data and service sharing

- INSPIRE Technical Guidelines
- Implementation in the Member States
- Licenses
- Open data

#### Monitoring and reporting

- INSPIRE Technical Guidelines
- Implementation in the Member States

### Cross cutting technical issues and INSPIRE architecture

- INSPIRE implementation / strategy in MS
- Registers and registries
- Conformance testing
- Computing infrastructures

#### **INSPIRE applications and software components**

- INSPIRE geoportal
- National geoportals
- Value added services and applications

#### **Communication**

#### **Cost benefit considerations**

Business models



# Working activities

- **Open Issues** from PisaTechnical roundtable:
  - Stakeholders
  - Confidentiality: public?
  - EUROSTAT implications
  - INSPIRE connection
  - What has to be included from WP2 Questionnaire

