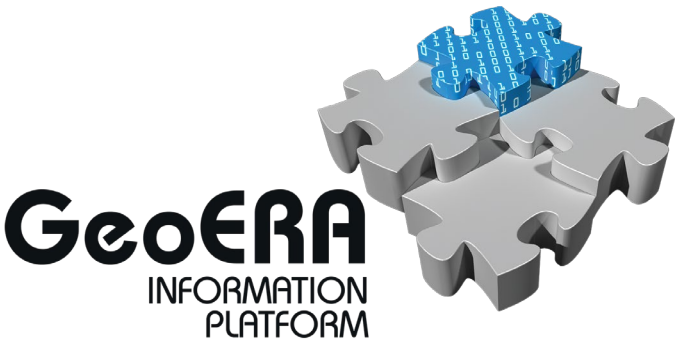

Deliverable 2.2.2

A second report refining the requirements after feedback exchanges related to the prototypes of the EGDI database and the display interface.

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GENERAL INTRODUCTION

The GeoERA Information Platform project (GIP-P) supports the 14 geoscientific projects (GSPs) comprised within GeoERA in organising and disseminating the geoinformation generated in their frameworks. The GIP-P is entitled to manage the data produced by each GeoERA project, archiving and making them available to citizens, researches and/or stakeholders. This will be achieved by extending the current European Geological Data Infrastructure (EGDI).

The different geoscientific projects deal with multiples aspects of geosciences in the fields of groundwater, raw materials, and geo-energy. These projects will thus generate a variety of products, which will require specific functionalities to be developed to store, show and share them properly. Hence, it is important that the GIP-P has a good understanding of the products that each project will generate, and the functionalities required to show them properly. This is assured by Work Package 2 (WP2), which coordinates the interactions between the various GeoERA projects and the GIP-P.

EXECUTIVE REPORT SUMMARY

The present report is the second and last deliverable derived from Task 2.2, the objective of which is to ensure that the research products delivered by each GeoERA project are identified and understood by the GIP-P. The information presented in this report builds on previous WP2 deliverables; i.e., D2.1.1, D2.2.1 and D2.3.1.

D2.2.2 provides information on the final datatypes (formats, way of delivery, etc.) that each GeoERA project will submit to EGDI. We also analyse and discuss the requirements (functionalities, etc.) made by the various geoscientific projects according to feedbacks from the different work packages of the GIP-P.

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DEFINITIONS

Attributes: information typically stored in the spatial data. Attributes usually consists of a series of parameters providing information about the objects, layers, etc. mapped in GIS. In the present report, we consider these as part of the spatial data that they describe.

Functionality: the range of operations that can be run on a computer or other electronic system.

GeoERA: Establishing the European Geological Surveys Research Area to deliver a Geological Service for Europe.

Geological model: A digital representation of portions of the earth's crust based on geophysical and geological observations.

Geomanifestation: specific expressions of geological processes (e.g., springs, earthquakes, etc.)

Product: any deliverable generated by a GeoERA project that will be available via EGDI. Projects will deliver 4 types of products:

1. **Spatial data:** data concerning phenomena implicitly or explicitly associated with a location within Earth. These typically are:
    - **2D, 2.5D and 3D GIS data:** shapefiles, GeoPackages, GeoTiffs, ASCII grids, etc.
    - **Geographically localized 3D models**
    - **Open Geospatial Consortium (OGC) Web services**: services defined by the OGC, allowing all kinds of geospatial functionality; e.g., WMS, WFS, ATOM. They include services for data access, data display and data processing.
2. **Non-spatial data**: documents (PDFs, text files, etc.), photos/images (JPGs, PDFs, etc.), datasets (TXT, CVS, etc.), URL (DOI, etc.), etc. These data can or cannot be linked to spatial data.
3. **Metadata:** data that provides information about spatial and non-spatial data (e.g., purpose of the data, time of creation, authors, etc.)
4. **Project vocabulary:** collections of terms with short descriptions, bibliographic citations and links to unstructured web contents used to define scientific parameters and concepts.

ABBREVIATIONS

3DGEO-EU: 3D geomodelling for Europe.

GARAH: Geological Analysis and Resource Assessment of selected Hydrocarbon systems.

GeoConnect³d: Cross-border, cross-thematic multiscale framework for combining geological models and data for resource appraisal and policy support.

CSW: Catalogue Service for the Web

DOI: Digital Object identifier

European FDB: European Fault Database

EGDI: European Geological Data Infrastructure

EuroLithos: European Ornamental stone resources

FRAME: Forecasting and Assessing Europe's Strategic Raw Materials needs

GIP-P: GeoERA Information Platform Project

GIS: Geographic Information System

GSO: Geological Survey Organization

GSPs: Geoscientific projects within GeoERA

HIKE: Hazard and Impact Knowledge for Europe.

HotLime: Mapping and Assessment of Geothermal Plays in Deep Carbonate Rocks – Cross-domain Implications and Impacts

HOVER: Hydrological processes and Geological settings over Europe controlling dissolved geogenic and anthropogenic elements in groundwater of relevance to human health and the status of dependent ecosystems.

JRC: **Joint Research Centre** (European Commission's science and knowledge service)

KSP: (HIKE) Knowledge SharePoint

MiCKA: EGDI software for (spatial data/services) metadata management.

MINDeSEA: Seabed Mineral Deposits in European Seas: Metallogeny and Geological Potential for Strategic and Critical Raw Materials.

MintelI4EU: Mineral Intelligence for Europe.

MUSE: Managing Urban Shallow Geothermal Energy.

OGC: Open Geospatial Consortium

PM: project month

RESOURCE: Resources of groundwater harmonized at cross-border and pan- European scale.

SKOS: Simple Knowledge Organization System

TACTIC: Tools for Assessment of Climate change Impact on groundwater and adaptation Strategies.

UNFC: United Nations Framework Classification for Resources

VoGERA: Vulnerability of Shallow Groundwater Resources to Deep Subsurface Energy-Related Activities.

WCS: Web Coverage Service

WFS: Web Feature Service

WMS: Web Map Service

WP: work package

1 INTRODUCTION

The GeoERA program consists of 14 geoscientific projects (GSPs), which are grouped in 3 different geological themes (Groundwater, Raw Materials and Geo-energy), and an information platform project (GIP-P). The latter is entitled to establish a common platform for organising and disseminating the data generated by the various GSPs.

Deliverable D2.2.2 is the second and last deliverable that the GIP-P WP2 will produce in the framework of Task 2.2. This report provides information on the final datatypes (formats, way of delivery, etc.) that each GeoERA project will deliver to EGDI. We also analyse and discuss the requirements (functionalities, etc.) made by the various geoscientific projects according to feedbacks from the GIP-P, as well as the way chosen by the projects to deliver their products to EGDI.

The information discussed in deliverable D2.2.2 builds on previous WP2 deliverables; i.e., D2.1.1, D2.2.1 and D2.3.1. We have also taken into consideration feedbacks from all GSPs and other GIP-P WPs (WP3/4/6/7/8) to define the contents of the present deliverable.

The new information discussed in the next sections of this manuscript was gathered between August and December 2019 from:

- feedbacks from the different GIP-P WPs on previous WP2 deliverables.
- Information exchanged between the GIP-P and the GSPs during a series of conference calls held in September and October 2019. These conference calls were organised by the GIP-P and attended by representatives and project leaders of all GSPs, as well as by representatives of GIP-P WPs 1,2,4,6 and 7.
- Information exchanged by email between the GIP-P and each GSP since April 2019.
- several conference calls organised in the framework of GIP-P WP3, WP6/7 and WP8 to discuss the information these work packages need to carry out their tasks.
- Specific feedbacks provided by WP4, WP6, WP7 and WP8 on the minimum requirements necessary to describe and visualize/share data in EGDI.

The present report is structured as follows. First, we briefly introduce how the GIP-P is extending EGDI to meet the requirements communicated by the various GSPs. Second, we discuss the products (formats, delivery methods, etc.) that each project will deliver to EGDI and the functionalities they require EGDI to support to archive, visualize and share them properly. Third, we provide general information about EGDI and the GSPs. Finally, we summarize all information provided in this report in Annex A.

Note that despite the efforts made by the various GeoERA projects to compile the data we required for the completion of this deliverable, some of the data provided in the present report are not final, as some projects are still refining the definition of products. Hence, this report may be subject to updates in the future.

2 EGDI EXTENSION

2.1 Functionalities and spatial database

In October 2018, WP2 of the GIP-P requested information from the various GeoERA projects on the functionalities that EGDI should support to properly show and share their data. The different

requirements communicated by the projects in term of data formats and functionalities were compiled in D2.2.1 and analysed in D2.3.1. The specific functionalities required by the various GSPs and the datatypes they will deliver to EDGI are further discussed in chapter 3 of this report in light of the latest information available from the GSPs and GIP-P. They are also summarized in Annex A.

The GIP-P undertook an extension of EGDI to accommodate the requirements expressed by the projects on how their data should be visualized, archived and shared in EGDI. This extension consists of improving some of the functionalities currently existing in EGDI and the creation of some new ones, including the creation of a 3D database and a 3D viewer.

EGDI has already been extended with a 3D database and a 3D viewer. The 3D database and viewer are not very sophisticated yet (see D2.3.1 for more information). Currently, EGDI can store and plot 3D surfaces derived from ASCII 2.5D grids and 3D models in GoCad formats; e.g., TSurf (triangle surfaces in 3D space), 2D-Grids (quadrangle surfaces in 3D space) and Pline (lines in 3D space). Further, the 3D database of EGDI has also importers for models created in GeoScene3D, GoCAD and for raster-based 2.5D models. Layers can also be imported from Petrel and the GIP-P is currently creating importers for LeapFrog formats. Note that the GIP-P might be able to create importers for other formats if required. If GSPs require that EGDI supports other 3D formats, they should provide that information as soon as possible, so the GIP-P can evaluate whether importers for those formats can be created.

EGDI 2D database and viewers have been extended to archive and visualize GIS files, as well as to retrieve data from web services stored at external servers. EGDI database can currently archive and visualize Shapefiles, GeoPackages and common raster graphics and grids. The GIP-P is still developing the database though. Hence, we may be able to make it compatible with other GIS formats if the geoscientific projects required so. However, present consensus holds that EGDI will not accept proprietary formats, as they may not be openable without a license or if the specific software that opens them is updated.

Importantly, every data that are to be shown in the map viewers must be archived or accessible through EGDI database. On the other hand, if (georeferenced) documents and other data are not to be shown in the map viewer (e.g., factsheets, reports, papers, etc.), they can be uploaded only to the document repository of EGDI, independently of whether they are (or are not) linked to spatial data (see next section of this manuscript). More information about the extension of EGDI will be provided in D 2.3.2, which is due in March 2020.

2.2 Document repository

The GIP-P is also extending EGDI with the creation of a digital archive (also referred to as document repository) to archive unstructured and non-spatial data. This document repository will be designed to archive all sort of documents; e.g., reports, images, photos, papers, tabular data, etc.

The architecture of EGDI's document repository is not fully defined yet, but it has been agreed that it will accept documents in any conventional, non-proprietary format (PDFs, Text files, JPG, CVS, etc.). The use of proprietary formats (EXCEL, WORD, etc.) is not recommended, as they will require that users possess licenses of specific software to consult them.

Documents stored in EGDI's document repository can be linked to spatial data shown in EGDI map viewers or to specific locations. Hence, it is important that those links are identified

beforehand by the projects and notified to the GIP-P when these documents are uploaded to the document repository.

Public documents stored in EGDI's document repository (e.g., reports, opensource papers, etc.) will be findable and downable/openable via EGDI. Documents subject to copyrights or temporary embargoes might also be findable at EGDI, but users will not be able to open or download them directly from EGDI. Rather, they will be archived as DOIs with some minor metadata description, so that users can find them at EGDI and be directed to where the documents are via their DOIs. Note that the GIP-P does not recommend the use of URL links to web pages or external servers other than DOIs in EGDI's document repository, as these links may stop working if something changes or are not properly maintained in the long term. DOIs, on the other hand, are permanent.

GSPs uploading documents and/or DOIs to EGDI's document repository will be asked to provide some metadata about them. These metadata will not be archived in MiCKA metadatabase; rather, they will form part of the information archived in EGDI's document repository. The GIP-P is currently defining the minimum (compulsory) metadata entries that should be filled out when uploading documents to EGDI document repository. The GIP-P will provide information to the GSPs on how (and which) documents can be uploaded to the document repository and the metadata requirements to do so in due time.

Recommendations to the projects concerning EGDI's digital archive:

- specify if documents should be linked to specific spatial data or locations shown in EGDI 2D/3D map viewers or to other documents stored in EGDI document repository.
- indicate if documents are or are not publicly available or if their availability is restricted to certain users (e.g., experts, academia, etc.).

2.3 Project vocabularies

One of the major challenges of GeoERA is to harmonize scientific terminology across national borders. Indeed, in geosciences, the nomenclature has grown from regional approaches with limited cross-border harmonization. Hence, the GeoERA projects are strongly encouraged to use standardized codes (e.g. GeoSciML, INSPIRE) to describe textual attributes. Consistent use of international standards creates the potential for semantic interoperability.

For metadata descriptions, the standardization of textual attributes applies mainly to keywords and the implementation of semantic searches in the metadata catalogue (MiCKA). GIP-P WP4 is compiling keywords from all GeoERA projects into a thesaurus, assigning Uniform Resource Identifiers (URIs) to them. So far, the GeoERA thesaurus comprises ~2500 geoscientific terms in English. Keywords included in the GeoERA thesaurus are translated into different languages and have links to standardized code lists (INSPIRE, GeoSciML, GEMET). More details about the GeoERA thesaurus can be found in D4.2 (https://geoera.eu/wp-content/uploads/2019/11/D4.2-GeoERA-Keyword-Thesaurus.pdf).

Concerning the textual attributes and scientific concepts comprised in the spatial data themselves, the GIP-P recommends the use of international standards (e.g., INSPIRE) whenever is possible. However, the diversity of (local/regional) terminologies may prevent to match some scientific parameters and concepts with international standards. In these cases, the GIP-P recommends the creation of a "project vocabulary". These are collections of terms with short descriptions, bibliographic citations and links to unstructured web contents used to define scientific parameters and concepts. Project vocabularies can manage semantic access to

applications (like web maps) by multilingual terminology. Specific terms defined in project vocabularies can contain regional, local and historical names of parameters and concepts (e.g., geological formations), creating links between transnational terminologies. The creation of project vocabularies and the technology behind them are explained in deliverable D4.3 of GIP-P WP4 (https://geoera.eu/wp-content/uploads/2019/11/D4.3-GeoERA-Project-Vocabularies.pdf).

Project vocabularies may also help to connect (the same) parameters across different GeoERA projects, thus harmonizing their definitions and improving semantic searches. In order to identify possible overlaps between concepts/parameters defined by different projects, GSPs creating vocabularies should do so with the assistance of GIP-P WP4 (contact person: Rob van Ede; rob.vanede@tno.nl). That will provide an overview of the concepts every project is defining to the GIP-P, allowing us to identify overlaps. Ideally, when/if overlapping concepts are identified and notified to the projects by the GIP-P, the concerned GSPs should get in contact to one another and work together to harmonise the definition of those concepts in their vocabularies.

The way that the definitions included in the various project vocabularies will be linked to the spatial data shown in EGDI is still under discussion. However, present consensus holds that users will be able to consult the definitions archived in project vocabularies directly at EGDI map viewers where the data are shown.

Recommendations to the projects concerning project vocabularies, thesaurus and standard code lists:

- For requiring assistance creating project vocabularies or inquiring about GeoERA thesaurus, contact GIP-P WP4.
- For requiring assistance standardizing textual attributes according to the standards accepted by EGDI, contact GIP-P WP8 (support@geoera.eu).

Table 1: comparison between international standards (e.g., INSPIRE), keyword thesauri and project vocabularies.

Use	Information to provide	Codelists (INSPIRE/GeoSciML)	Keyword Thesaurus	GeoERA project vocabularies
Scientific scope	**short description**	optional	optional	mandatory
	bibliographic citation	shortened	no	mandatory
	ontology, principle of modelling	SKOS	SKOS, what else could be searched for…	SKOS, partitive or generic-specific
Use case	**search metadata (e.g. MICKA)**	no	yes	no
	connect datasets	yes	no	yes
	select features semantically	partly	no	yes
	prepare codelist extensions (e.g. INSPIRE)	N/A	no	yes
	included mappings	no	INSPIRE, GeoSciML,	INSPIRE, GeoSciML, gba, wikidata, etc.

Use	Information to provide	Codelists (INSPIRE/GeoSciML)	Keyword Thesaurus	GeoERA project vocabularies
			gemet, gba, etc.	
	multilingual	partly	yes	possibly
	maintenance	JRC	EGDI	projects
	extendable	only officially	Yes, by EGDI/MiCKA	by follow up project vocabulary
	web API	no	Sparql endpoint	Sparql endpoint
	archive download	registry tables	yes, RDF	yes, RDF
	type of vocabulary	European standard	subject heading system	knowledge base
	Poly-hierarchies	no	yes	yes

2.4 Metadatabase

The GI-P has updated EGDI metadatabase (usually known as MiCKA) to meet the requirements of GeoERA. The new metadatabase is operative since December 2019 (http://www.europe-geology.eu/metadata/). The new metadata catalogue is described in GIP-P D7.1 (https://geoera.eu/wp-content/uploads/2019/12/D7.1-Working-version-Metadatabase.pdf).

Tutorials and guidelines on how to upload metadata in EGDI metadata catalogue will be provided to all GeoERA projects in due time. It is therefore recommended that all GSPs appoint a person or a group of people as “metadata representatives” to attend eventual workshops, follow webinar tutorials, etc. The contact details of those people must be notified to GIP-P WP2 as soon as possible.

There are 2 main ways of delivering metadata to EGDI: 1) by filling out the metadata sheets in MiCKA web interface, and 2) by archiving metadata in Catalogue Service for the Web (CSW) stored in external servers from where MiCKA can harvest them. The GIP-P has no preference; it is up to the projects to decide how they would like to deliver metadata to EGDI. However, the modality chosen by the projects for providing metadata must be notified to the GIP-P WP8 as soon as possible. Especially, if projects are archiving metadata in external digital catalogues from where MiCKA must harvest them, as the GIP-P must verify that the metadata stored in those catalogues complies with the minimum metadata requirements of EGDI.

Currently, most of the projects appear to favour the option of filling out metadata directly into MiCKA (see Tables 2 to 42, in Chapter 3, and Table 1 in Annex A). However, some GSPs will require harvesting from CSW. There has also been some discussion on whether EGDI could harvest metadata from the KINDRA catalogue.

Recommendations to the projects concerning metadata:

- GSPs compiling metadata in CSW should send the GIP-P WP8 as much information as possible about them, thus the GIP-P can evaluate their compatibility with MiCKA.

3 GEOSCIENTIFIC PROJECTS – DATA FORMATS AND REQUIRED FUNCTIONALITIES

In this chapter, we provide an update on the products that each geoscientific project is creating in the framework of GeoERA, as well as the functionalities they require EGDI to support to visualize and share their data (see also Annex A). In the present report, “spatial data” refers to the data that will be shown in EGDI map viewers, including their associated metadata, attributes and definitions comprised in project vocabularies. Whereas, “non-spatial data” refers to data that will be accessible through other EGDI digital archives and web interfaces; e.g., EGDI document repository.

3.1. RESOURCE

Products

The RESOURCE project will generate the following main products:

- A pan-European map of groundwater resources. This is a multi-layer GIS file, providing information on hydrofacies, geologic age and parameters for aquifers and aquitards. The pan-European map is based on the INSPIRE shapefile 10x10 km cell-side grid defined for Europe (https://www.eea.europa.eu/data-and-maps/data/eea-reference-grids-2).
- Georeferenced factsheets that summarize important findings.
- Georeferenced reports from selected pilot areas.

Note that the RESOURCE project will not create a project vocabulary as, in principle, most of the attributes and parameters they describe are INSPIRE compliant. However, there may be some exceptions that must be crosschecked with the GIP-P to be sure that they are compliant with GeoERA expectations. For example, RESOURCE will utilize the concept “hydrogeological facies” or “hydrofacies” in relationship with some lithologies; this terms are not INSPIRE compliant. The GIP-P thus recommends RESOURCE to check with GIP-P WP8 whether those concepts can be standardized by using other international standards accepted by EGDI. If that is not the case, RESOURCE should consider defining those concepts following the guidelines stablished by GIP-P WP4 for describing scientific concepts within a project vocabulary.

RESOURCE’s products are listed and described in Tables 2 and 3. More details about their formats, attributes, etc. can be consulted in RESOURCE D2.2.

Table 2: spatial data that RESOURCE will deliver to EGDI according to RESOURCE D2.2.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
1	Pan-European groundwater resources map	Polygons	ESRI Shapefile	direct upload to EGDI database	EPSG:3035	Attributes can be delivered as tabular data integrated in shapefiles or as separate (tabular) files (e.g., Excel, CVS, etc.). Note however that the GIP-P's preferred option is to include as much information as possible in the GIS files and to avoid providing data in proprietary formats when possible.
		Tabular data (attributes)	Excel file	direct upload to EGDI database	N/A	
2	Polygons defining the location of Pilot sites	Polygons	ESRI Shapefile	direct upload to EGDI database	EPSG:3035 and 3034	Some attributes of these products will be URL links to local or national databases, and/or to other webGIS portals (see RESOURCES D2.2).
3	Points marking the Location of the information provided in the factsheets	Points	ESRI Shapefile	direct upload to EGDI database	EPSG:3035 and 3034	
4	Metadata	N/A	N/A	Direct editing in MiCKA metadata catalogue	N/A	

Table 3: Documents and other (non-spatial) data that RESOURCE will deliver to EGDI according to RESOURCE D2.2.

	Product	Formats	Availability to EGDI	Linked to spatial data or to a location	Other information
5	Reports on pilot studies and Factsheets	PDFs	Direct upload to EGDI document repository	Yes, to N°2 and Nº3	EGDI users should be able to access these reports and factsheets directly from EGDI webGIS portal by clicking on the polygons defining the extents of the study areas.

Functionalities: required vs. EGDI expected extension

In this section, we provide an update on the requirements that RESOURCE has made in terms of functionalities and on the feedbacks provided by EGDI on this regard.

Table 4: Functionalities required by RESOURCE, feedbacks provided by EGDI (D2.3.1) and new information derived from RESOURCE D2.2.

Requirements	EGDI feedback D2.3.1	RESOURCE feedback (D2.2) and other information
Searching for maps	This should be possible in EGDI; i.e., when a map is selected from the search tool, the map will open with a selection of predefined active layers and with a predefined zoom level.	This is a requirement for the Pan-European groundwater resources map.
Interface to upload and thematize Shapefiles	This has already been created.	
Web page with all services	This is being implemented in EGDI.	Suggestions on how the data should be visualized are provided in the appendix of RESOURCE D2.2
Overview panel	A simple version of this functionality already exists in EDGI	

Requirements	EGDI feedback D2.3.1	RESOURCE feedback (D2.2) and other information
Legend with tree view/hierarchical on/off switching	The GIP-P is adding this functionality to EGDI.	Pan-European groundwater resources map follows HME1500 - International Hydrogeological Map of Europe 1:1,500,000. See suggestions for the map's legend in RESOURCE D2.2, page 17. Details on how the switching should work are in appendix B of RESOURCE D2.2.
Export Map	EGDI will be able to export all element plotted in map viewers as high-resolution images.	Requested for the pan-European groundwater resources map.
Download data with or without access control	The GIP-P is adding this functionality to EGDI.	RESOURCE do not require access control. All data shared with EGDI will be publicly available. The preferred format for downloading the reports and factsheets is PDF.
Identify + follow link	This functionality already exists in EDGI	The links included in the spatial data associated with reports and factsheets will open PDFs or maps archived in external databases (national/local databases or web application that allows visualization at regional or national level). For the pan-European map, RESOURCE suggests that when clicking or selecting a grid cell/s a PDF containing information (metadata) about that/those grids pops up.
Specific projection	Data can be uploaded to EGDI in any projection as long as it can be converted to EPSG:3034. EGDI would rather plot all data in EPSG:3034 for consistency, since that is the official projection of EGDI.	RESOURCE believes that plotting data in EPSG:3034 may potentially induce visualization issues on their data. They therefore require the use EPSG:3035 for visualizing data in the RESOURCE map viewer that will be accessible through EGDI.

Requirements	EGDI feedback D2.3.1	RESOURCE feedback (D2.2) and other information
Create virtual logs from table data or 2.5D layers	The GIP-P is adding this functionality to EGDI.	EGDI users should be able to create virtual logs (CGRC view) from the attributes associated with the pan-European groundwater resources map. See appendix B of RESOURCE D2.2 for information on what these logs should show. The RESOURCE project has created a script that generate virtual boreholes. The GIP-P and RESOURCE will discuss whether it is necessary (and possible) for the GIP-P to use that script for generating virtual logs.
Create virtual cross section from 2.5D layers from a user define geometry	The GIP-P is adding this functionality to EGDI.	RESOURCE requires that EGDI will be able to generate virtual cross sections from lines drawn by EGID users across the pan-European groundwater resource map. These cross sections must show information from all displayed layers (RESOURCE called this "CGRC section view"). See appendix B of RSOURCE D2.2 for details on what should be shown in these cross sections.
Create simple queries and filters from the webGIS interface	GIP-P is adding this functionality to EGDI.	Requested for the pan-European groundwater resources map (see appendix B of RSOURCE D2.2).

3.2. VoGERA

Products

VoGERA will generate only reports. Consequently, VoGERA does not require the creation of a project vocabulary.

The various products that VoGERA will deliver to EGDI are summarised in Tables 5 and 6. Details on the products' formats, attributes, etc. are described in RESOURCE D2.2.

Table 5: spatial data that VoGERA will deliver to EGDI according to VoGERA D2.2.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
1	Location of pilot sites	Polygons	ESRI Shapefiles	direct upload to EGDI database	EPSG:3034	
2	Metadata	N/A	N/A	Direct editing in MiCKA metadata catalogue.	N/A	

Table 6: Documents and other (non-spatial) data that VoGERA will deliver to EGDI according to VoGERA D2.2.

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
3	A report for every pilot site (i.e., 5 reports)	PDFs	Direct upload to EGDI document repository	Yes (See Table 5)	EGDI users should be able to access these reports directly from EGDI webGIS portal by clicking on the polygons defining the extents of the study areas.
4	Common tool with a methodology for characterizing the vulnerability of shallow groundwater to deep industrial activities	(possibly Excel) spreadsheets	Direct upload to EGDI document repository	No	

Functionalities: required vs. EGDI expected extension

In this section, we provide an update on the requirements that VoGERA has made in terms of functionalities and on the feedbacks provided by EGDI on this regard.

Table 7: Functionalities required by VoGERA and feedbacks provided by EGDI (D2.3.1).

Requirements	EGDI feedback (D2.3.1)	VoGERA feedback (D2.2) and other information
Search Documents	The following functionalities will be available at EGDI: searching through metadata, datasets and documents directly from the EGDI portal; Searching through documents; and ranking results based on relevance.	
Interface to upload and thematize Shapefiles	This functionality already exists in EDGI	These 4 functionalities are required for the "product Location of pilot sites".
Web page with all services	The GIP-P is adding this functionality to EGDI.	
Overview panel	A simple version of this functionality already exists in EDGI	
Legend with tree view/hierarchical on/off switching	The GIP-P is adding this functionality to EGDI.	
Download data with or without access control	The GIP-P is adding this functionality to EGDI.	• Reports should be findable and downloadable in their original formats (PDF and Excel). • VoGERA does not require access control for any of their documents.

3.3. HOVER

Products

HOVER will generate 33 products, including multilayer GIS data and reports from different parts of Europe. HOVER products are listed in Tables 8 and 9. Details on the products' formats, attributes, etc. are described in RESOURCE D2.2. HOVER does not require the creation of a project vocabulary.

Table 8: spatial data that HOVER will deliver to EGDI according to HOVER D2.2.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
1	Thermal and natural mineral waters in Europe.	Polygons	WMS	direct access via web services	EPSG: 3035	
2	European exposure maps of selected elements (and indicators).	Polygons	WMS	direct access via web services	EPSG: 3035	
3	Locations of pilot sites from Denmark, France, Latvia (and Ireland?)	points	ESRI shapefile or GeoPackage	direct upload to EGDI database	As requested by EGDI	
4	Conceptual models of nitrate transport in the unsaturated zone	Polygons	ESRI shapefile	direct upload to EGDI database	EPSG: 4326	
5	Georeferenced report on nitrate monitoring data	Polygons	ESRI Shapefile	direct upload to EGDI database	EPSG: 4326	
6	Georeferenced reports on denitrification potential mapping	Polygons	ESRI Shapefile	direct upload to EGDI database	EPSG: 4326	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
7	Travel times for nitrate in the unsaturated zone	Raster	ESRI Grid (ASCII)	direct upload to EGDI database	EPSG: 4326	
8	Nitrate stored in the unsaturated zone	Multi-dimensional gridded data	NetCDF	direct upload to EGDI database	EPSG: 4326	The GIP-P is currently analysing whether NetCDF format is compatible with EGDI database. HOVER will send examples to GIP-P WP6 for testing.
9	Database structure for storage of probably 10-15 environmental tracers (mainly isotopes)	Database (X,Y,Z)	Excel or Access files	direct upload to EGDI database	As requested by EGDI	
10	Maps, cross sections and (potentially) 3D representations	lines and/or polygons	ESRI shapefile or GeoPackage	direct upload to EGDI database	As requested by EGDI	These files consist of polygons defining the extents of HOVER's WP6 pilot areas (approximately 10), as well as the extents of the models shown in 3D representations. Whereas, linear features will define the extents of cross sections. Maps, 3D representations and cross sections will be stored in EGDI document repository and should be linked to these spatial data (see Table 9).

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
11	Selected pilots' studies for ground water age	Polygons or georeferenced maps	ESRI shapefile or GeoPackage	direct upload to EGDI database	As requested by EGDI	
12	European Groundwater Vulnerability Map to Pollution (DRASTIC)	Raster	GeoTIFF	direct upload to EGDI database	EPSG: 3035	
13	European Groundwater Vulnerability Map to Pollution. INPUT DATA maps (DRASTIC)	Raster	GeoTIFF	direct upload to EGDI database	EPSG: 3035	This product consists of 7 raster maps (one per DRASTIC parameters).
14	Groundwater Vulnerability Map to Pollution in Pilot Areas (DRASTIC)	Raster	GeoTIFF	direct upload to EGDI database	EPSG: 3035	
15	Groundwater Vulnerability to Pollution INPUT DATA Maps in Pilot Areas according to DRASTIC	Raster	GeoTIFF	direct upload to EGDI database	EPSG: 3035	This product comprises 63 raster maps; i.e., one map per DRASTIC parameter. There are 9 pilot areas, each comprising 7 DRASTIC parameters.
16	Groundwater Vulnerability Map to Pollution in Pilot Areas (COP)	Raster	GeoTIFF	direct upload to EGDI database	EPSG: 3035	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
17	Groundwater Vulnerability to Pollution INPUT DATA Maps in Pilot Areas according to COP.	Raster	GeoTIFF	direct upload to EGDI database	EPSG: 3035	This product consists of 15 raster maps; i.e., one map per COP parameter. There are 5 pilot areas, each one with 3 COP parameters.
18	Vulnerability summary in Pilot Areas: Polygons map with the location of the case study	Polygons	ESRI shapefile	direct upload to EGDI database	EPSG: 3035	
19	European map that synthesizes the state of knowledge of each Member State on the presence of selected Emerging Organic Compounds in groundwater	Points	ESRI shapefile	direct upload to EGDI database	EPSG: 3035	
20	Metadata	N/A	N/A	Direct editing in MiCKA meta-database	N/A	

Table 9: Documents and other (non-spatial) data that HOVER will deliver to EGDI according to HOVER D2.2.

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
21	Report on mineral and thermal waters in participating countries	PDF	Direct upload to EGDI document repository	No	
22	Reports on 4–6 pilot sites in Denmark, France, Latvia (and Ireland?)	PDF	Direct upload to EGDI document repository	Yes, to N°3	EGDI users should be able to access this and the other reports linked to spatial data directly from EGDI webGIS portal by clicking on the polygons/lines/points defining their location.
23	Description of conceptual models of nitrate transport in the unsaturated zone	PDF	Direct upload to EGDI document repository	Yes, to N°4	
24	Georeferenced report of nitrate monitoring (WP5 D52.2)	PDF	Direct upload to EGDI document repository	Yes, to N°5	
25	Georeferenced reports of denitrification potential mapping	PDF	Direct upload to EGDI document repository	Yes, to N°6	

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
26	Cross sections and maps linked to profile lines and pilot areas/polygons defined by of product N°10	JPG, PNG and PDF	Direct upload to EGDI document repository	Yes, to N°10	All WP6 partners shall be able to upload and show maps and cross sections of groundwater age distributions in aquifers or wells in their respective pilot area/s. These maps use different colour codes for different age intervals as described in HOVER D6.1b.
27	WP6 Reports	PDF	Direct upload to EGDI document repository	Yes, to N°9 and N°10	
28	Reports I and II on Comparison of internationally commonly applied index methodologies for assessing the vulnerability of the upper aquifer to pollution	PDF	Direct upload to EGDI document repository	No	

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
29	Report III on Vulnerability summary in Pilot Areas: pilot description and 2D schematic cross section in the assessment of aquifer vulnerability	PDF	Direct upload to EGDI document repository	Yes, to N°18	
30	Selected Pictures linked to product 19	JPG	Direct upload to EGDI document repository	Yes, to N°19	Selected pictures to be shown on the map depending on the zoom scale.
31	Critical review report of European monitoring results for organic emerging contaminants	PDF	Direct upload to EGDI document repository	No	
32	Report with recommendations for monitoring of key parameters with reference to environmental context, geological setting and risk assessment	PDF	Direct upload to EGDI document repository	No	

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
33	Report describing new sampling analyses and interlaboratory tests directed towards potential hotspots for emerging contaminants transport	PDF	Direct upload to EGDI document repository	No	

Functionalities: required vs. EGDI expected extension

In this section, we provide an update on the requirements that HOVER has made in terms of functionalities and on the feedbacks provided by EGDI on this regard.

Table 10: Functionalities required by HOVER, feedbacks provided by EGDI (D2.3.1) and new information derived from HOVER D2.2.

Requirements	EGDI feedback (D2.3.1)	HOVER feedback (D2.2) and other information
Search based on location	The GIP-P is adding this functionality to EGDI. Searches by coordinates will be performed by using geographic coordinates (latitude/longitude).	This is a requirement for products numbers 1–5 and 9–18 (see Table 8).
Search Documents	This will be implemented in EGDI by creating the following functionalities: searching through metadata, datasets and documents directly from the EGDI portal; Searching through documents; and ranking results based on relevance.	This is a requirement for all reports, and for products number 4, 15, 16, 17 and 18 (see Tables 8 and 9).
Searching for maps		This is a requirement for products numbers 10 and 11.
Interface to upload and thematize shapefiles and GeoPackages	The GIP-P is adding this functionality to EGDI.	Requested for all spatial data, except for products number 1 and 2, which will be harvested.

Requirements	EGDI feedback (D2.3.1)	HOVER feedback (D2.2) and other information
Web page with all services	The GIP-P is adding this functionality to EGDI.	Requested for all spatial data. Product N°1 also requests the addition of a topographic background map.
Overview panel	A simple version of this functionality already exists in EDGI	This is a requirement for products number 1, 2, and 12–17.
Legend with tree view / hierarchical on/off switching	The GIP-P is adding this functionality to EGDI.	This is a requirement for products number 1, 2, 4, 7, 8, 9 and 18. • Product N°1: several layers (e.g., temperature classes, intended uses, total dissolved solid classes) should be individually visualized. • Product N°2: It will be possible to select different elements and different indicators and show them separately or at the same time. • Product N°9: HOVER requires that pilot areas are coloured using a specific colour codes (predefined by HOVER), showing whether a tracer database exist or not. Product N°18: possibility to select different fields from attributes and show them individually in map viewer (e.g. aquifer type, primary water use, method to assess groundwater vulnerability to pollution, etc.)
Export map	EGDI will be able to export all element plotted in map viewers as high-resolution images.	For this, WMS/WFS must be able to deliver high resolution images. This functionality is required for products number 1, 7, and 12–18. For products N°1 and N°18, HOVER suggest that the composition displayed in the viewer will be exported in PDF or JPG formats, with scale and arrow indicating north included. HOVER may also require the option to export maps as georeferenced images.

Requirements	EGDI feedback (D2.3.1)	HOVER feedback (D2.2) and other information
Download data with or without access control	The GIP-P is adding this functionality to EGDI.	Requested for all products. Documents should be downloaded in the formats they were uploaded into EGDI database and document repositories. Products N°9 and N°11 request access control, as some datasets and reports may have restrictions on download. These datasets will be partially public. HOVER will notify which parts are public and which are not in due time.
Identify + follow link	This functionality already exists in EDGI	This is a requirement for products number 1, 3–6, 10, and 12–18 (see Table 8).
Handling time component	This functionality may require that data are delivered as WCSs with time component, so the user interface can select which time step to show.	This functionality mainly concerns product N°8, which will be delivered in Netcdf format. EGDI should allow users to select specific years to visualize the nitrate stored in the unsaturated zone measured that year. The user should be able to operate a slider tool to change the time within a given time interval.
Multiscaling	The GIP-P is adding this functionality to EGDI.	This functionality mainly concerns product numbers 1, 7, 8, and 19. the reference scale for product N°1 is 1:5,000,000. Products N°7 and N°8 have restricted view below European level. Product N°19: when users zoom in on a specific country, more details are displayed, with the apparition of pie charts. Scale of product N°2 is set at 1: 5,000,000
Transparency	The GIP-P is adding this functionality to EGDI.	This functionality mainly concerns product numbers 12–17.

Requirements	EGDI feedback (D2.3.1)	HOVER feedback (D2.2) and other information
Creation of statistical diagrams, rose diagrams, histograms…	EGDI will be able to create statistical diagrams. However, projects must send examples to GIP-P WP6 of what exactly they expect from this functionality. Thus, the GIP-P will be able to create the exact functionality required for that.	This functionality was not originally requested by HOVER. It has been added in October 2019. Requested by products number 1 and 19. Product N°1 requires that EGDI shows basic statistical information on selected parameters. Product N°19 requires that EGDI creates: • histogram showing the number of site/year where OECs have been sought. • Pie charts showing types of OECs (e.g., number of molecules sought per family type: pharmaceuticals, industrial, etc).
Create simple queries and filters from the webGIS interface	The GIP-P is adding this functionality to EGDI.	Requested for product number 1 and 2. Examples of how HOVER see this functionality can be consulted in HOVER D2.2 section 3.3.2.
From getfeatureinfo creation of an automatic report querying a selection of layers	A simple version of this functionality already exists at EGDI. The GIP-P is currently updating it.	Requested for product N°1. This functionality should work as follow: after selecting a source in the map, the user will be provided with a report containing information on certain parameters (see HOVER D2.2). Users should be able to generate reports (PDF format) from multiple selections; e.g., by selecting multiple natural mineral water or thermal water sources.
Handling and displaying 3D models	A simple version of this functionality already exists in EDGI	These functionalities were not originally requested by HOVER. They have been added in October 2019. Requested for product N°10, which requires 3D visualisation for groundwater ages constrained from a given number of wells. This functionality will be set in collaboration with Danish water companies and GEUS (see details in HOVER D2.2, section 6.3.1.2).
Transparency of 3D	This should be possible in the final version of EGDI 3D viewer.	
Virtual borehole	This should be possible in the final version of EGDI 3D viewer.	

3.4. TACTIC

Products

TACTIC will generate 23 products, including multilayers pan-European maps and several reports. The various products and delivery formats are summarised in Tables 11 and 12. Details on the products' formats, attributes, etc. are described in RESOURCE D2.2. TACTIC does not require the creation of a project vocabulary.

Table 11: Spatial data that TACTIC will deliver to EGDI according to TACTIC D2.2.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
1	Pilot study reports	several geometries	ESRI shapefile, GRID ASCII	direct upload to EGDI database	As requested by EGDI	Not yet clear if the collection of metadata will be by direct editing in MiCKA or harvesting from other metadatabase for this dataset.
2	On-line dynamic sensor measurements of changes; e.g., changes of water table depth and electrical conductivity.	Points (X,Y,Z)	Undefined, possibly JSON or WFS/WCS	direct access via web services	As requested by EGDI	Not clear yet whether the metadata of these data will be delivered to EGDI by direct editing in MiCKA or whether they will be in CSW, from where they can be harvested by MiCKA. Recommendation : Please, check with GIP-P WP6 and WP8 whether JSON formats are compatible with EGDI before deciding on the delivery format.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
3	Groundwater table changes in Europe	Raster	GeoPackage	direct upload to EGDI database	EPSG:4326	This product consists of several rasters. Each raster may cover several time periods. For example, a raster containing information on groundwater table changes for the period 1980–2000 and another for the period 2000-2020.
4	Water balance changes in Europe	Points or polygons	ESRI shapefile	direct upload to EGDI database	EPSG:4326	
5	Pan-European net precipitation maps	Raster	WMS/WCS and GeoPackages	Both direct upload to EGDI database and direct access via web services	EPSG:3857 and EPSG: 4326	Raster' cell size: 1–5 km^2
6	Recharge values at selected locations	Points or polygons	WMS and GeoPackage	Both direct upload to EGDI database and direct access via web services	EPSG:3857 and EPSG: 4326	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
7	Schematics showing time variant recharge values and uncertainty analysis over selected period (Static)	Points	WMS	Direct access via web services	EPSG:3857 and EPSG: 4326	
8	Map displaying aquifer vulnerability to climate change	Raster	WMS and GeoPackage	Both direct upload to EGDI database and direct access via web services	EPSG:3857 and EPSG: 4326	
9	Schematics showing time variant recharge values and uncertainty analysis over selected period (Dynamic)	Points	WMS and GeoPackage	Both direct upload to EGDI database and direct access via web services	EPSG:3857 and EPSG: 4326	The collection of metadata linked to this product will be delivered to EGDI by harvesting.
10	Statistical values at selected points	Points	WMS and GeoPackage	Both direct upload to EGDI database and direct access via web services	EPSG:3857 and EPSG: 4326	
11	Schematics showing groundwater level values and trends over selected period (Static)	Points	WMS	Direct access via web services	EPSG:3857 and EPSG: 4326	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
12	Geological 3D model from Emilia Romana	3D models; XYZ points; 3D polylines ; 3D polygons ; 3D meshes (volumes)	OBJ, 2.5D ASCII Grids, WMS, WFS and ESRI 3D Shapefiles	Both direct upload to EGDI database and direct access via web services	EPGS: 5659	A Partner from TACTIC has already send to GIP-P WP6 an example of a 3D model extracted from Leaprog (volumes in OBJ format and surfaces in ASCII format). The collection of metadata of this product will be delivered by harvesting from CSW url: http://geoportale.regione.emilia-romagna.it/rer_csw/
13	Pilots description and assessment report for sea/saltwater intrusion	Polygons	ESRI Shapefile	direct upload to EGDI database	EPGS: 4326	
14	Pilots description and assessment report for adaptation	Polygons	ESRI Shapefile	direct upload to EGDI database	EPGS: 4326	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
15	Metadata	N/A	N/A	Both, direct editing in MiCKA and harvesting form CSWs.	N/A	For most products, metadata will be directly encoded in MiCKA. Some however will require harvesting from CSWs (see Table 11).

Table 12: Documents and other (non-spatial) data that TACTIC will deliver to EGDI according to TACTIC D2.2.

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
16	Reports and Figures	PDFs	Direct upload to EGDI document repository	Yes, to product N°1 (see Table 11)	
17	Reports and files attached to product N°3 and N°4 (see Table 11)	PDF, JPG and TXT	Direct upload to EGDI document repository	Yes, to products N°3 and N°4	
18	Time variant recharge plots calculated by the different tools and methods	PDF or JPGs	Direct upload to EGDI document repository	Yes, to product N°7 locations	These plots should be displayed in EGDI map viewers when clicking on product 7. TACTIC also requires the possibility to download these plots in PDF format.

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
19	Plots showing time series of information and statistical information like trends.	PDF or JPGs	Direct upload to EGDI document repository	Yes, to product Nº11 locations	These plots should be displayed in EGDI map viewers when clicking on product 11. TACTIC also requires the possibility to download these plots in PDF format.
20	Journal papers	PDF	Direct upload to EGDI document repository	No	TACTIC will deliver the authors' PDF copies and DOIs.
21	Report from all WP5 tasks (Technical note of the method to assess seawater intrusion & Guideline for WP5)	PDF	Direct upload to EGDI document repository	No	
22	Pilots description and assessment report for adaptation	PDF	Direct upload to EGDI document repository	Yes, to product N°14 locations	
23	Report from all the WP6 tasks (Development of climate change projections and adaptation scenarios & Guideline for WP6)	PDF	Direct upload to EGDI document repository	No	

Functionalities: required vs. EGDI expected extension

In this section, we provide an update on the requirements that TACTIC has made in terms of functionalities and on the feedbacks provided by EGDI on this regard.

Table 13 : Functionalities required by TACTIC, feedbacks provided by EGDI (D2.3.1) and new information derived from TACTIC D2.2.

Requirements	EGDI feedback (D2.3.1)	TACTIC feedback (D2.2) and other information
Search based on location	The GIP-P is adding this functionality to EGDI. Searches by coordinates will be performed by using geographic coordinates (latitude/longitude).	Requested for product numbers 3–11 and 13–14 (see Table 11).
Search Documents	This will be implemented in EGDI by creating the following functionalities: searching through metadata, datasets and documents directly from the EGDI portal; Searching through documents; and ranking results based on relevance.	Requested for product numbers 13 and 16–18 (see Table 11).
Interface to upload and thematize shapefiles and GeoPackages	The GIP-P is adding this functionality to EGDI.	Most of the spatial data will use this functionality.
Web page with all services	The GIP-P is adding this functionality to EGDI.	Requested by product number 2–11. • For product N°2, TACTIC suggests following SGU website form for online dynamic sensor. • Products N°3 and N°4 require topographic base maps (https://www.eea.europa.eu/data-and-maps/data/eea-reference-grids-2)
Overview panel	A simple version of this functionality already exists in EDGI	Requested for products number 3, 4, 5 and 8. Product N°3 and N°4 request to set the scale at 1:5,000,000.

Requirements	EGDI feedback (D2.3.1)	TACTIC feedback (D2.2) and other information
Legend with tree view / hierarchical on/off switching	The GIP-P is adding this functionality to EGDI.	Requested for products number 3, 4, 13 and 16 Products N°3 and N°4 require that different climate change scenarios will be display and visualized individually.
Export map	EGDI will be able to export all elements plotted in map viewers as high-resolution images.	Requested for products number 3–7, 9–11, 13 and 14. For products N°3 and N°4, TACTIC requires the possibility to export the composition displayed in the viewer in PDF or JPG formats, with scale and arrow indicating north.
Download data with or without access control	The GIP-P is adding this functionality to EGDI.	No access control is required for product numbers 1–5, 7, and 14–22. All the reports listed in Table 12 should be downloadable in PDF format. For product N°2, data may be downloaded in JSON and CVS formats.
Identify + follow link	This functionality already exists in EDGI	Requested for product number 3, 4, 7 and 11.
Display a graph with time series data	It is possible to include links to external services that can deliver time series.	Requested for product N°9.
Multiscaling	The GIP-P is adding this functionality to EGDI.	This functionality was not originally requested by TACTIC. It has been added in November 2019 (see TACTIC D2.2). Requested for products number 3–6 and 9–10. For products N°3 and N°4, the reference scale should be set at 1:1,5000,000
Transparency	The GIP-P is adding this functionality to EGDI.	This functionality was not originally requested by TACTIC. It has been added in November 2019 (see D2.2). Requested for product N°8.

Requirements	EGDI feedback (D2.3.1)	TACTIC feedback (D2.2) and other information
Metadata compatible with other EU inventories	Harvesting from CSWs is possible.	For most products, TACTIC will encode metadata directly in EGDI/MiCKA metadatabase. Some however will require harvesting from CSWs (see Table 11). Hence, this functionality may be required for the partners that choose to deliver metadata in the latter way. Recommendation: before creating CSWs and start archiving metadata, contact the GIP-P WP8 (support@geoera.eu) to crosscheck whether their structure, metadata requirements, etc. are compatible with MiCKA.
Handling and displaying 3D models	A simple version of this functionality already exists in EDGI	Request by product N°12
Virtual cross section	A simple version of this functionality will be available in the final version of EGDI 3D database/viewer	Request by product N°12

3.5 EuroLithos

Products

EUROLITHOS will generate 10 products, providing information on dimension and ornamental stones, together with some documents and images. These products are listed and discussed in Tables 14 and 15.

Table 14: Spatial data that EUROLITHOS will deliver to EGDI according to information provided by the project between September and December 2019.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
1	Geological provinces of ornamental stones.	Polygons	WMS and/or WFS	direct access via web services	EPSG:3034	All these products form part of the "Atlas of European Ornamental Stones".
2	Location of ornamental stones deposit, prospect and occurrence.	Points and Polygons				

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
3	Location of mines (quarries)	Points				
4	Location of building/construction (with list of unique stone types)	Points	Under discussion	Under discussion	Under discussion	It has not been decided yet whether this will be delivered as an extension of Minerals4EU or as a separate database. A decision will be made after testing has finished.
5	List of unique and denominated stone types (“product name”)	Code list (extends commodity type?)	Under discussion	direct upload to EGDI database (attributes linked to the spatial dataset)	Under discussion	This product will be linked to the project vocabulary of Minerals4EU. The definition of this product is not finalized yet.
6	Project vocabulary	N/A	Excel files	Undefined	N/A	INSPIRE is not enough to define dimension stones. We need unique names that link each commodity to specific lithologies and locations. EuroLithos is in contact with GIP-P WP4 to see if a project vocabulary can solve that.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
7	Metadata	N/A	N/A	Harvesting from CSW	N/A	

Table 15: Documents and other (non-spatial) data that EUROLITHOS will deliver to EGDI according to information provided by the project between September and December 2019.

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
8	Guidelines for the Atlas of European Ornamental Stones (for external users) and a few other similar reports.	PDF	Direct upload to EGDI document repository	No	
9	Directory of ornamental stone properties: Descriptions, photos, analyses and technical information.	Tables (text, URIs, structured data, etc.) and images.	Direct upload to EGDI document repository	Yes, via "unique stone name"	There may be other projects in GeoERA that plan to provide similar information on minerals and/or stones. Hence, the information contained in this directory should be harmonized with information from other projects.
10	Guidelines for using the directory of ornamental stone properties (how to input data)	PDF	Direct upload to EGDI document repository	No	

Functionalities: required vs. EGDI expected extension

In this section, we provide an update on the requirements that EUROLITHOS has made in terms of functionalities and on the feedbacks provided by EGDI on this regard.

Table 16 : Functionalities required by EUROLITHOS and feedbacks provided by EGDI (D2.3.1).

Requirements	EGDI feedback (D2.3.1)	Other information
Search based on location	The GIP-P is adding this functionality to EGDI. Searches by coordinates will be performed by using geographic coordinates (latitude/longitude).	EUROLITHOS requires search based on location in combination with project vocabulary information.
Search Documents	This will be implemented in EGDI by creating the following functionalities: searching through metadata, datasets and documents directly from the EGDI portal; Searching through documents; and ranking results based on relevance.	The GIP-P recommends uploading all documents into EGDI document repository (see section 2.2).
Web page with all services	The GIP-P is adding this functionality to EGDI.	The web page will comprise a list of all services, including both the services directly available from EGDI platform and those drawn from the thematic projects.
Overview panel	A simple version of this functionality already exists in EDGI	
Export map	EGDI will be able to export all elements plotted in map viewers as high-resolution images.	
Download data with or without access control	The GIP-P is adding this functionality to EGDI.	Recommendation for data to which this functionality should be applied: • Specify the output formats (PDF, JPG, etc.) and any specific characteristics (projections, etc.) for downloadable files and the information that should be included in them. • The data for which access control is required should be clearly highlighted, specifying whether it should be restricted to all publics or available to some users. Please, state the reason (e.g., embargo, etc.).

Requirements	EGDI feedback (D2.3.1)	Other information
Identify + follow link	This functionality already exists in EDGI	
Metadata compatible with other EU inventories	Harvesting from CSW is possible.	MiCKA can harvest metadata from CSWs hosted in external servers. However, the metadata compiled in those CSWs must be compliant with MiCKA standards. That is, metadata stored in CSWs must contain the same mandatory fields than those archived in MiCKA. Projects must also guarantee that the links to those catalogues will be operative in the long term. Recommendation: before creating CSWs and start archiving metadata, contact the GIP-P WP8 (support@geoera.eu) to crosscheck whether the structure, metadata format, etc. are compatible with MiCKA.
Create simple queries and filters from the web GIS interface	The GIP-P is adding this functionality to EGDI.	
From getfeatureinfo creation of an automatic report querying a selection of layers	A simple version of this functionality already exists at EGDI. The GIP-P is currently updating it.	When providing the data to EGDI, please, specify the layers to which this functionality should be applied and the attributes, tables, etc., from where the data included in the reports should come from.
Linkage to Semantics/Project Vocabulary (link from the map to the project vocabulary and vice versa).	This will be available for all projects creating project vocabularies.	

3.6 FRAME

Products

FRAME will generate 17 products on critical and strategic raw materials in Europe. Tables 17 and 18 contain a list of the products that FRAME will provide to EGDI. The products described in this chapter are not final, as some FRAME partners have not finished defining their data yet. Hence, the information provided in Tables 17 and 18 might be updated in the future.

Table 17: spatial data that FRAME will deliver to EGDI according to information provided by the project in October 2018 (D2.2.1) and between October and December 2019.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
1	Critical and Strategic Minerals Map of Europe: Mineral occurrences/deposits spatial distribution on land and the marine environment.	Vector	WMS, WFS	direct access via web services	EPSG:3034	Linked to MINDeSEA project.
2	Critical and Strategic Minerals Map of Europe: Metallogenetic map	Raster or grid	Under discussion	Direct upload to EGDI database or direct access via web services	EPSG:3034	The formats in which (and how) these products will be sent to EGDI have not been defined yet.
3	Critical and Strategic Minerals Map of Europe: Potential/ prospectivity maps	Raster or grid	Under discussion	Direct upload to EGDI database or direct access via web services	EPSG:3034	The formats in which (and how) these products will be sent to EGDI have not been defined yet.
4	CRM in phosphate deposits and associated black shales: Update on “Mineral occurrences/deposits spatial distribution”	Vector	WMS, WFS or WCS	direct access via web services	EPSG:3034	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
5	Energy Critical Elements (Li, Co and graphite): Potential / prospectivity maps	Raster or grid	WMS or another (GIS) format	Direct upload to EGDI database or direct access via web services	EPSG:3034	The formats in which (and how) these products will be sent to EGDI have not been defined yet.
6	Mineral Occurrences and Mines update for Nb-Ta mineralisation	Vector	WMS, WFS or WCS	direct access via web services	EPSG:3034	
7	Mineral Occurrences and Mines update for historical mines (mining waste)	Vector	WMS, WFS or WCS	direct access via web services	EPSG:3034	
8	Project vocabulary	Tables	EXCEL files	Undefined	N/A	FRAME has identified some missing terms in INSPIRE for some mineral commodities. They are (together with Mintell4EU and MINDeSEA) working on a "theme" vocabulary.
9	Metadata	N/A	N/A	Undefined.	N/A	FRAME is still discussing how metadata will be delivered to EGDI. It is likely that some partners choose to deliver them via CSW and other via direct editing in MiCKA.

Table 18: Documents and other (non-spatial) data that FRAME will deliver to EGDI according to information provided by the project in October 2018 (D2.2.1) and between October and December 2019.

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
10	Report: Methodology used for the identification and selection process of the CRM to be included in the metallogenetic map.	PDF	Direct upload to EGDI document repository	Yes	
11	CRM in phosphate deposits and associated black shales: Metallogenetic studies	PDF	Direct upload to EGDI document repository	Yes	Georeferenced to the location of the study
12	CRM in phosphate deposits and associated black shales: New geological, chemical-mineralogical and geochronological data on selected deposits.	PDF	Direct upload to EGDI document repository	Yes	Georeferenced to the location of the deposits
13	Conflict minerals (Nb - Ta): Recommendations for future exploration in Europe	PDF	Direct upload to EGDI document repository	No	

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
14	Conflict minerals (Nb - Ta): Possibilities for relieving European import dependence	PDF	Direct upload to EGDI document repository	No	
15	Historical mine sites revisited: Potential target areas	PDF	Direct upload to EGDI document repository	Yes	Georeferenced to target areas
16	Historical mine sites revisited: case studies	PDF	Direct upload to EGDI document repository	Yes	Georeferenced to case study areas
17	Historical mine sites revisited: final report	PDF	Direct upload to EGDI document repository	Yes	

Functionalities: required vs. EGDI expected extension

In this section, we provide an update on the requirements that FRAME has made in terms of functionalities and on the feedbacks provided by EGDI on this regard.

Table 19 : Functionalities required by FRAME and feedbacks provided by EGDI (D2.3.1).

Requirements	EGDI feedback (D2.3.1)	Other information
Search based on location	The GIP-P is adding this functionality to EGDI. Searches by coordinates will be performed by using geographic coordinates (latitude/longitude).	

Requirements	EGDI feedback (D2.3.1)	Other information
Search Documents	This will be implemented in EGDI by creating the following functionalities: searching through metadata, datasets and documents directly from the EGDI portal; Searching through documents; and ranking results based on relevance.	The GIP-P recommends uploading all documents to EGDI document repository (see section 2.2).
Web page with all services	The GIP-P is adding this functionality to EGDI.	The web page will comprise a list of all services, including both the services directly available from EGDI platform and those drawn from the thematic projects.
Overview panel	A simple version of this functionality already exists in EDGI	
Export map	EGDI will be able to export all elements plotted in map viewers as high-resolution images.	
Download data with or without access control	The GIP-P is adding this functionality to EGDI.	Recommendation for data to which this functionality should be applied: • Specify the output format (PDF, JPG, etc.) and any specific characteristics (projections, etc.) for downloadable files and the information that should be included in them. • The data for which access control is required should be clearly highlighted, specifying whether it should be restricted to all publics or available to some users. Please, state the reason (e.g., embargo, etc.).
Identify + follow link	This functionality already exists in EDGI	

Requirements	EGDI feedback (D2.3.1)	Other information
Metadata compatible with other EU inventories	Harvesting from CSW is possible.	MiCKA can harvest metadata from CSWs hosted in external servers. However, the metadata compiled in those CSWs must be compliant with MiCKA standards. That is, metadata stored in CSWs must contain the same mandatory fields than those archived in MiCKA. Projects must also guarantee that the links to those catalogues will be operative in the long term. Recommendation: before creating CSWs and start archiving metadata, contact the GIP-P WP8 (support@geoera.eu) to crosscheck whether their structure, metadata format, etc. are compatible with MiCKA.
Create simple queries and filters from the web GIS interface	The GIP-P is adding this functionality to EGDI.	
An upload system for the static data	Importers for static data are being created.	
From getfeatureinfo creation of an automatic report querying a selection of layers	A simple version of this functionality already exists at EGDI. The GIP-P is currently updating it.	When providing the data to EGDI, please, specify the layers to which this functionality should be applied and the attributes, tables, etc., from where the data included in the reports should come from.
Visualization of reports in HTML	This functionality will be discussed in D2.3.2.	This requirement is mentioned in FRAME D8.1. However, the information provided in that report about it is too general for the GIP-P to evaluate whether it is possible to create this functionality in the timeframe of GeoERA. FRAME will provide more information and examples for the GIP-P to evaluate the feasibility of this functionality.
Measurement tool	A distance measuring tool can be included in EGDI.	
Interactive GIS maps with online calculator	This functionality will be discussed in D2.3.2.	This requirement is described in FRAME D8.1 as: “Different visualization filter to allow statistical analyses at European or countries levels”. This description is too general for the GIP-P to evaluate whether it is possible to create this functionality in the timeframe of GeoERA. FRAME is preparing examples to allow an accurate evaluation of the feasibility of this requirement by the GIP-P.

Requirements	EGDI feedback (D2.3.1)	Other information
Linkage to Semantics/Project Vocabulary (link from the map to the project vocabulary and vice versa).	This will be available for all projects creating project vocabularies.	

3.7 MINDeSEA

Products

MINDeSEA is producing 91 products on the principal types of mineral resources found on the seabed of European seas (e.g., hydrothermal sulphides, ferromanganese crusts, phosphorites, marine placers and polymetallic nodules). We list and describe all the products this project will deliver to EGDI in Tables 20 and 21.

Table 20: Spatial data that MINDeSEA will deliver to EGDI according to information provided by the project in December 2019. Default scale of all spatial data should be set at 1:250,000.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Geographic coverage and other information
1	Bathymetry, AUV Bathymetry, Backscatter, Sub-bottom Profile (SBP), Seismic, Gravimetry and magnetometry, Dredge and ROV	vector	Shapefile + Excel file (Attributes)	direct upload to EGDI database	EPSG: 4326	Macaronesia, Bay of Biscay and the Iberian coasts, Mediterranean Sea
2	Bathymetry, AUV Bathymetry, Backscatter, Sub-bottom Profile (SBP), Seismic, Gravimetry and magnetometry, Dredge, ROV	vector	Shapefile + Excel file (Attributes)	direct upload to EGDI database	EPSG: 4326	North Sea and Arctic
3	Bathymetry, AUV Bathymetry, Backscatter, Sub-bottom Profile (SBP), Seismic, Gravimetry and magnetometry, Dredge, ROV	vector	Shapefile + Excel file (Attributes)	direct upload to EGDI database	EPSG: 4326	Adriatic Sea and Aegean-Levantine Sea

N°	Product	Type	Format	Delivered by	Projection (delivery)	Geographic coverage and other information
4	Bathymetry, AUV Bathymetry, Backscatter, Sub-bottom Profile (SBP), Seismic, Gravimetry and magnetometry, Dredge, ROV	vector	Shapefile + Excel file (Attributes)	direct upload to EGDI database	EPSG: 4326	North Atlantic Ocean, Celtic Seas
5	Bathymetry, AUV Bathymetry, Backscatter, Sub-bottom Profile (SBP), Seismic, Gravimetry and magnetometry, Dredge, ROV	vector	Shapefile + Excel file (Attributes)	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Atlantic Iberian margins
6	Bathymetry, AUV Bathymetry, Backscatter, Sub-bottom Profile (SBP), Seismic, Gravimetry and magnetometry, Dredge, ROV	vector	Shapefile + Excel file (Attributes)	direct upload to EGDI database	EPSG: 4326	Arctic and Norwegian Sea
7	Bathymetry, AUV Bathymetry, Backscatter, Sub-bottom Profile (SBP), Seismic, Gravimetry and magnetometry, Dredge, ROV	vector	Shapefile + Excel file (Attributes)	direct upload to EGDI database	EPSG: 4326	Baltic Sea
8	Bathymetry, AUV Bathymetry, Backscatter, Sub-bottom Profile (SBP), Seismic, Gravimetry and magnetometry, Dredge, ROV	vector	Shapefile + Excel file (Attributes)	direct upload to EGDI database	EPSG: 4326	Black Sea

N°	Product	Type	Format	Delivered by	Projection (delivery)	Geographic coverage and other information
9	Marine Mineral Areas exlored in European Seas (Map Service)	raster; vector	WMS, WFS	direct upload to EGDI database. Also available from web services.	EPSG: 4326	European Seas: Adriatic, Atlantic, Arctic, Baltic, Black, Celtic, North, Mediterranean.
10	Mineral Potential and Prospectivity in European Seas (Map Service)	raster; vector	WMS, WFS	direct upload to EGDI database. Also available from web services.	EPSG: 4326	European Seas (Adriatic, Atlantic, Arctic, Baltic, Black, Celtic, North, Mediterranean)
11	MINDeSEA_WP5_IGME-Gr_MarinePlacers_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Central and Eastern Mediterranean Sea, Adriatic, Ionian Sea, Aegean-Levantine Sea, Celtic Seas, North Sea, Baltic Sea
12	MINDeSEA_WP5_IGME-Gr_MarinePlacers_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Central and Eastern Mediterranean Sea, Adriatic, Ionian Sea, Aegean-Levantine Sea, Celtic Seas, North Sea, Baltic Sea
13	MINDeSEA_WP5_IGME-Sp_MarinePlacers_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia, Bay of Biscay and the Iberian coasts, Western Mediterranean Sea, North Atlantic and Arctic, Norwegian Sea

N°	Product	Type	Format	Delivered by	Projection (delivery)	Geographic coverage and other information
14	MINDeSEA_WP5_IGME-Sp_MarinePlacers_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia, Bay of Biscay and the Iberian coasts, Western Mediterranean Sea, North Atlantic and Arctic, Norwegian Sea
15	MINDeSEA_WP5_IPMA_MarinePlacers_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Iberian coasts
16	MINDeSEA_WP5_IPMA_MarinePlacers_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Iberian coasts
17	MINDeSEA_WP5_LNEG_MarinePlacers_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Atlantic Iberian margins
18	MINDeSEA_WP5_LNEG_MarinePlacers_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Atlantic Iberian margins
19	MINDeSEA_WP5_GIU_MarinePlacers_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Black Sea
20	MINDeSEA_WP5_GIU_MarinePlacers_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Black Sea

N°	Product	Type	Format	Delivered by	Projection (delivery)	Geographic coverage and other information
21	Mineral Types (marine placer occurrence) in European Seas (Map Service)	raster; vector	WMS, WFS	direct upload to EGDI database. Also available from web services.	EPSG: 4326	European Seas (Adriatic, Atlantic, Arctic, Baltic, Black, Celtic, North, Mediterranean)
22	MINDeSEA_WP4_IGME-Sp_Phosphorites_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia, Bay of Biscay and the Iberian coasts, Western and Ionian and the Central Mediterranean Sea
23	MINDeSEA_WP4_IGME-Sp_Phosphorites_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia, Bay of Biscay and the Iberian coasts, Western and Ionian and the Central Mediterranean Sea
24	MINDeSEA_WP4_BGR_Phosphorites_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Celtic Seas, North Sea, Baltic Sea, Adriatic Sea and Aegean-Levantine Sea)
25	MINDeSEA_WP4_BGR_Phosphorites_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Celtic Seas, North Sea, Baltic Sea, Adriatic Sea and Aegean-Levantine Sea)
26	MINDeSEA_WP4_LNEG_Phosphorites_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Atlantic Iberian margins

N°	Product	Type	Format	Delivered by	Projection (delivery)	Geographic coverage and other information
27	MINDeSEA_WP4_LNEG_Phosphorites_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Atlantic Iberian margins
28	MINDeSEA_WP4_GIU_Phosphorites_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Black Sea
29	MINDeSEA_WP4_GIU_Phosphorites_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Black Sea
30	MINDeSEA_WP4_IGEO_Phosphorites_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	North Atlantic and Norwegian Sea
31	MINDeSEA_WP4_IGEO_Phosphorites_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	North Atlantic and Norwegian Sea
32	MINDeSEA_WP4_IPMA_Phosphorites_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Iberian coasts
33	MINDeSEA_WP4_IPMA_Phosphorites_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Iberian coasts
34	MINDeSEA_WP4_USGS_Phosphorites_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	North Atlantic and Arctic

N°	Product	Type	Format	Delivered by	Projection (delivery)	Geographic coverage and other information
35	MINDeSEA_WP4_USGS_Phosphorites_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	North Atlantic and Arctic
36	MINDeSEA_WP4_VNIIO_Phosphorites_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Baltic Sea and Arctic
37	MINDeSEA_WP4_VNIIO_Phosphorites_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Baltic Sea and Arctic
38	Mineral-potential and Prospectivity European Seas (Map Service)	raster; vector	WMS, WFS	direct upload to EGDI database. Also available from web services.	EPSG: 4326	European Seas (Adriatic, Atlantic, Arctic, Baltic, Black, Celtic, North, Mediterranean)
39	MINDeSEA_WP4_IGME-Sp_Crusts_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia, Bay of Biscay and the Iberian coasts, Western and Ionian and the Central Mediterranean Sea
40	MINDeSEA_WP4_IGME-Sp_Crusts_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia, Bay of Biscay and the Iberian coasts, Western and Ionian and the Central Mediterranean Sea

N°	Product	Type	Format	Delivered by	Projection (delivery)	Geographic coverage and other information
41	MINDeSEA_WP4_BGR_Crusts_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Celtic Seas, North Sea, Baltic Sea, Adriatic Sea and Aegean-Levantine Sea)
42	MINDeSEA_WP4_BGR_Crusts_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Celtic Seas, North Sea, Baltic Sea, Adriatic Sea and Aegean-Levantine Sea)
43	MINDeSEA_WP4_LNEG_Crusts_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Atlantic Iberian margins
44	MINDeSEA_WP4_LNEG_Crusts_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Atlantic Iberian margins
45	MINDeSEA_WP4_GIU_Crusts_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Black Sea
46	MINDeSEA_WP4_GIU_Crusts_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Black Sea
47	MINDeSEA_WP4_IGEO_Crusts_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	North Atlantic and Norwegian Sea
48	MINDeSEA_WP4_IGEO_Crusts_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	North Atlantic and Norwegian Sea

N°	Product	Type	Format	Delivered by	Projection (delivery)	Geographic coverage and other information
49	MINDeSEA_WP4_IPMA_Crusts_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Iberian coasts
50	MINDeSEA_WP4_IPMA_Crusts_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Iberian coasts
51	MINDeSEA_WP4_USGS_Crusts_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	North Atlantic and Arctic
52	MINDeSEA_WP4_USGS_Crusts_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	North Atlantic and Arctic
53	MINDeSEA_WP4_VNIIO_Crusts_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Baltic Sea and Arctic
54	MINDeSEA_WP4_VNIIO_Crusts_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Baltic Sea and Arctic
55	Mineral-potential and Prospectivity European Seas (Map Service)	raster; vector	WMS, WFS	direct upload to EGDI database. Also available from web services.	EPSG: 4326	European Seas (Adriatic, Atlantic, Arctic, Baltic, Black, Celtic, North, Mediterranean)

N°	Product	Type	Format	Delivered by	Projection (delivery)	Geographic coverage and other information
56	MINDeSEA_WP6_IGME-Sp_Nodules_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia, Bay of Biscay and the Iberian coasts, Western and Ionian and the Central Mediterranean Sea
57	MINDeSEA_WP6_IGME-Sp_Nodules_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia, Bay of Biscay and the Iberian coasts, Western and Ionian and the Central Mediterranean Sea
58	MINDeSEA_WP6_BGR_Nodules_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Celtic Seas, North Sea, Baltic Sea, Adriatic Sea and Aegean-Levantine Sea
59	MINDeSEA_WP6_BGR_Nodules_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Celtic Seas, North Sea, Baltic Sea, Adriatic Sea and Aegean-Levantine Sea
60	MINDeSEA_WP6_LNEG_Nodules_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Atlantic Iberian margins
61	MINDeSEA_WP6_LNEG_Nodules_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Atlantic Iberian margins
62	MINDeSEA_WP6_SGU_Nodules_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Baltic Sea

N°	Product	Type	Format	Delivered by	Projection (delivery)	Geographic coverage and other information
63	MINDeSEA_WP6_SGU_Nodules_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Baltic Sea
64	MINDeSEA_WP6_GIU_Nodules_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Black Sea
65	MINDeSEA_WP6_GIU_Nodules_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Black Sea
66	MINDeSEA_WP6_IGEO_Nodules_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	North Atlantic and Norwegian Sea
67	MINDeSEA_WP6_IGEO_Nodules_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	North Atlantic and Norwegian Sea
68	MINDeSEA_WP6_IPMA_Nodules_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Iberian coasts
69	MINDeSEA_WP6_IPMA_Nodules_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Macaronesia and the Iberian coasts
70	MINDeSEA_WP6_USGS_Nodules_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	North Atlantic and Arctic

N°	Product	Type	Format	Delivered by	Projection (delivery)	Geographic coverage and other information
71	MINDeSEA_WP6_USGS_Nodules_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	North Atlantic and Arctic
72	MINDeSEA_WP6_VNIIO_Nodules_poly.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Baltic Sea and Arctic
73	MINDeSEA_WP6_VNIIO_Nodules_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Baltic Sea and Arctic
74	Polymetallic Nodules deposits in European Seas (Map Service)	raster; vector	WMS, WFS	direct upload to EGDI database. Also available from web services.	EPSG: 4326	European Seas (Adriatic, Atlantic, Arctic, Baltic, Black, Celtic, North, Mediterranean)
75	MINDeSEA_WP3_NGU_SMS_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Norwegian and Icelandic Exclusive Economic Zones
76	MINDeSEA_WP3_GSI_SMS_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Irish and UK Exclusive Economic Zones
77	MINDeSEA_WP3_LNEG_SMS_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Portuguese Exclusive Economic Zone

N°	Product	Type	Format	Delivered by	Projection (delivery)	Geographic coverage and other information
78	MINDeSEA_WP3_IGME-Sp_SMS_pts.shp	vector	Shapefile	direct upload to EGDI database	EPSG: 4326	Spanish Exclusive Economic Zone, Italian and Cypriot waters
79	European seafloor massive sulphite deposits (Map Service)	raster; vector	WMS, WFS	direct upload to EGDI database. Also available from web services.	EPSG: 4326	European Seas (Adriatic, Atlantic, Arctic, Baltic, Black, Celtic, North, Mediterranean)
81	Project vocabulary	N/A	Excel files	direct upload to EGDI database	N/A	MINDeSEA is creating a project vocabulary. They just established contact with GIP-P WP4 to start working on that.
82	Metadata	N/A	N/A	direct editing in MiCKA meta-database	N/A	

Table 21: Documents and other (non-spatial) data that MINDeSEA will deliver to EGDI according to GIP-P report D2.2.1 and information provided by the project between September 2019 and January 2020.

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
83	Project reports	PDF	Direct upload to document repository	Yes	the report for each mineral occurrence should be linked to the location of the occurrence.
84	Models for the formation of European SMS deposits	PDF	Direct upload to document repository	Yes	

85	Potential for SMS mineral deposits	PDF	Direct upload to document repository	Yes	PDF containing maps of potential for SMS mineral deposits
86	Report highlighting the endowment and exploration potential of CRM associated with submarine ferromanganese crusts and phosphorites in Europe	PDF	Direct upload to document repository	No	
87	Literature review report on regulation, legislation and exploitation of ferromanganese crusts and phosphorites.	PDF	Direct upload to document repository	No	
88	Report of the polymetallic nodules prospect evaluation parameters	PDF	Direct upload to document repository	No	
89	Report of the polymetallic nodules prospect evaluation for European waters	PDF	Direct upload to document repository	No	
90	Literature review report of exploration for submarine mineral deposits around Europe	PDF	Direct upload to document repository	No	

91	Collection of publications and other relevant documents used for the creation of MINDeSEA products	PDFs and DOIs	Direct upload to document repository	Yes	MINDeSEA is gathering a series of publications associated with MINDeSEA data. They will provide them to EGDI, distinguishing between publicly accessible documents and those that are not. These documents will be delivered as both PDFs and DOIs (PDFs will not be accessible by the public for restricted documents).

Functionalities: required vs. EGDI expected extension

In this section, we provide an update on the requirements that MINDeSEA has made in terms of functionalities and on the feedbacks provided by EGDI on this regard.

Table 22: Functionalities required by MINDeSEA and feedbacks provided by EGDI (D2.3.1).

Requirements	EGDI feedback	Comments
Search based on location	The GIP-P is adding this functionality to EGDI. Searches by coordinates will be performed by using geographic coordinates (latitude/longitude).	
Search Documents	This will be implemented in EGDI by creating the following functionalities: searching through metadata, datasets and documents directly from the EGDI portal; Searching through documents; and ranking results based on relevance.	The GIP-P recommends uploading all documents into EGDI document repository (see section 2.2).
Interface to upload and thematize shapefiles and GeoPackages	The GIP-P is adding this functionality to EGDI.	

Requirements	EGDI feedback	Comments
Web page with all services	The GIP-P is adding this functionality to EGDI.	The web page will comprise a list of all services, including both the services directly available from EGDI platform and those drawn from the thematic projects.
Overview panel	A simple version of this functionality already exists in EDGI	
Export map	EGDI will be able to export all elements plotted in map viewers as high-resolution images.	
Download data with or without access control	The GIP-P is adding this functionality to EGDI.	Recommendation for data to which this functionality should be applied: • Specify the output format (PDF, JPG, etc.) and any specific characteristics (projections, etc.) for downloadable files and the information that should be included in them. • The data for which access control is required should be clearly highlighted, specifying whether it should be restricted to all publics or available to some users. Please, state the reason (e.g., embargo, etc.).
Identify + follow link	This functionality already exists in EDGI	
Create simple queries and filters from the web GIS interface	The GIP-P is adding this functionality to EGDI.	
From getfeatureinfo creation of an automatic report querying a selection of layers	A simplified version of this functionality already exists in EDGI	
Handling and displaying 3D models	A simple version of this functionality already exists in EDGI	These requirements will depend upon the choice MINDeSEA makes on how to share 3D data. If they are shared as 3D PDFs, these functionalities may not be needed anymore.
Virtual borehole	Simple versions of these functionalities will be available in the final version of EGDI 3D database/viewer	
Virtual cross section		

Requirements	EGDI feedback	Comments
Linkage to Semantics/Project Vocabulary (link from the map to the project vocabulary and vice versa).	This will be available for all projects creating project vocabularies.	

3.8 Mintell4EU

Products

Mintell4EU will update the Electronic European Minerals Yearbook and the Mineral Inventory of Minerals4EU, as well as producing several reports. Mintell4EU is not creating a project vocabulary. The products Mintell4EU will deliver to EGDI are listed in Tables 23 and 24.

Table 23: Spatial data that Mintell4EU will deliver to EGDI according to D2.2.1, D2.1.1 and information provided by the project in December 2019.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
1	Update on minerals Inventory: Mineral occurrences	Vector	WFS	direct access via web services	EPSG:3034	
2	Update on minerals Inventory: Mines	Vector	WFS	direct access via web services	EPSG:3034	
3	European countries with associated tables containing data from the e-Minerals Yearbook (production, trade, reserves etc.)	Vector	Shapefiles	Direct upload to EGDI database	EPSG:3034	The polygons will be colour-coded according to values in the e-Minerals Yearbook; e.g., yearly production of Cu.
4	Metadata	N/A	N/A	Direct editing in MiCKA metadatabase	N/A	

Table 24: Documents and other (non-spatial) data that Mintell4EU will deliver to EGDI, according to D2.2.1, D2.1.1 and information provided by the project in December 2019.

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
5	Report describing the processes developed for updating the electronic European Minerals Yearbook	PDF	Direct upload to document repository	No	

Functionalities: required vs. EGDI expected extension

In this section, we provide an update on the requirements that Mintell4EU has made in terms of functionalities and on the feedbacks provided by EGDI on this regard.

Table 25: Functionalities required by Mintell4EU and feedbacks provided by EGDI (D2.3.1).

Requirements	EGDI feedback (D2.3.1)	Other information
Search based on location	The GIP-P is adding this functionality to EGDI. Searches by coordinates will be performed by using geographic coordinates (latitude/longitude).	
Search Documents	This will be implemented in EGDI by creating the following functionalities: searching through metadata, datasets and documents directly from the EGDI portal; Searching through documents; and ranking results based on relevance.	The GIP-P recommends uploading all documents into EGDI document repository (see section 2.2).
Interface to upload and thematize shapefiles and GeoPackages	The GIP-P is adding this functionality to EGDI.	
Web page with all services	The GIP-P is adding this functionality to EGDI.	The web page will comprise a list of all services, including both the services directly available from EGDI platform and those drawn from the thematic projects.

Requirements	EGDI feedback (D2.3.1)	Other information
Overview panel	A simple version of this functionality already exists in EDGI	
Export map	EGDI will be able to export all elements plotted in map viewers as high-resolution images.	
Download data with or without access control	The GIP-P is adding this functionality to EGDI.	Recommendation for data to which this functionality should be applied: • Specify the output format (PDF, JPG, etc.) and any specific characteristics (projections, etc.) for downloadable files and the information that should be included in them. • The data for which access control is required should be clearly highlighted, specifying whether it should be restricted to all publics or available to some users. Please, state the reason (e.g., embargo, etc.).
Identify + follow link	This functionality already exists in EDGI	
Creation of statistical diagrams, rose diagrams, histograms…	EGDI will be able to generate statistical diagrams.	Mintell4EU provided an example of what they meant with this functionality. The GIP-P is confident that they can meet Mintell4EU requirement. Recommendation: Mintell4EU and the GIP-P should work together to refine the implementation of this functionality in EGDI by further testing.
Create simple queries and filters from the web GIS interface	The GIP-P is adding this functionality to EGDI.	
From getfeatureinfo creation of an automatic report querying a selection of layers	A simplified version of this functionality already exists in EDGI	

Requirements	EGDI feedback (D2.3.1)	Other information
Functionality to show statistical data of the yearbook in EGDI	There is a functionality currently available at EGDI that may be used for that, but it needs some programming to be fully functional. There is also the possibility of working with time series.	EGDI has been upgraded to show the statistical data of Mintell4EU yearbook. EGDI can also colour European countries according to different values of a parameter encoded in the attributes, as requested by Mintell4EU (see Table 23).
Visualizing the data according to UNFC classification	This functionality may be out of the scope of GeoERA. More information about the feasibility of this functionality will be provided in D2.3.2.	If times allows it, the GIP-P might include this functionality in EGDI for the projects that require it.

3.9 GeoConnect^{3}d

Products

GeoConnect^{3}d is producing 20 products on geological structures and geological processes (geomanifestations). We describe them in Tables 26 and 27.

Table 26: Spatial data that GeoConnect^{3}d will deliver to EGDI according to information provided by the project between September and December 2019.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
1	Geological limits database	Vector	Shapefiles and GeoPackages	Direct upload to EGDI database	EPSG:3035 and EPSG:3034	Geological limits include faults and other geological surfaces; e.g., unconformities, plate boundaries, etc. For faults, GeoConnect^{3}d will use an updated HIKE's FDB.
2	Geological units	Vector	Shapefiles and GeoPackages	Direct upload to EGDI database	EPSG:3035 and EPSG:3034	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
3	Geomanifestations (various data types)	Vector, Raster, Grids, JPG	Annotated 2D objects and photos; WMS might be used for some data (e.g., for seismic data).	Direct upload to EGDI database	EPSG:3035 and EPSG:3034	The database for geomanifestations will be developed by the GIP-P based on the data provided by GeoConnect^{3}d
4	Evaluation of deep geothermal exploitation		Undefined	Undefined	Undefined	This product is still under discussion. It may be included into the geo-manifestations.
5	Traffic light maps derived from properties of 2D/3D models	Vector	Shapefiles	Direct upload to EGDI database	EPSG:3035 and EPSG:3034	
6	2D structural/geological models	Vector	Shapefiles	Direct upload to EGDI database	EPSG:3035 and EPSG:3034	
7	Buffer	Vector	Shapefiles	Direct upload to EGDI database	EPSG:3035 and EPSG:3034	Buffers will be halos around the geological limits, with colouring fading outwards.
8	3D structural and geological models	3D Voxet models 2.5D grids	Possibly 3D shapefiles and other 3D and 2.5D formats supported by EGDI. Some models may be delivered as WMS.	Direct upload to EGDI database. Perhaps, some by direct access via web services.	EPSG:3035 and EPSG:3034	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
9	Project vocabulary	N/A	Excel files	Direct upload to EGDI database	N/A	GeoConnect^{3}D is working closely with HIKE and GIP-P WP4 on this issue. The vocabulary for the structural framework is well on track. A vocabulary will also be created for geomanifestations.
10	Metadata	N/A	N/A	Direct editing in MiCKA.	N/A	

Table 27: Documents and other (non-spatial) data that GeoConnect^{3}D will deliver to EGDI according to information provided by the project in December 2019.

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
11	Intra- and inter-thematic exchange logbook	PDF	Direct upload to EGDI document repository	No	
12	Report on fault property requirements	PDF	Direct upload to EGDI document repository	No	
13	Report and publication(s) on the two-step framework-geomanifestation methodology	PDF; DOIs	Direct upload to EGDI document repository	No	

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
14	Scientific publication on annotated R2R models	PDF; DOIs	Direct upload to EGDI document repository	Yes	
15	Report on ways to disclose essential subsurface data and information to different stakeholders	PDF	Direct upload to EGDI document repository	No	
16	Report on geomanifestations with their physical, spatial- and temporal (4D) analysis	PDF	Direct upload to EGDI document repository	Yes	
17	Scientific publication on geomanifestations	PDF; DOIs	Direct upload to EGDI document repository	Yes	
18	Report on lessons learnt from the Pilot areas	PDF	Direct upload to EGDI document repository	No	
19	Generic evaluation scheme for subsurface activities	PDF	Direct upload to EGDI document repository	No	
20	Links to blog posts with preview images	URLs, JPGs	Direct upload to EGDI document repository	Yes	

Functionalities: required vs. EGDI expected extension

In this section, we provide an update on the requirements that GeoConnect^{3}d has made in terms of functionalities and on the feedbacks provided by EGDI on this regard.

Table 28 : Functionalities required by GeoConnect^{3}d and feedbacks provided by EGDI (D2.3.1).

Requirements	EGDI feedback (D2.3.1)	Other information
Search Documents	This will be implemented in EGDI by creating the following functionalities: searching through metadata, datasets and documents directly from the EGDI portal; Searching through documents; and ranking results based on relevance.	The GIP-P recommends uploading all documents to EGDI document repository (see section 2.2).
Interface to upload and thematize shapefiles and GeoPackages	The GIP-P is adding this functionality to EGDI.	
Web page with all services	The GIP-P is adding this functionality to EGDI.	The web page will comprise a list of all services, including both the services directly available from EGDI platform and those drawn from the thematic projects.
Export map	EGDI will be able to export all elements plotted in map viewers as high-resolution images.	
Download data with or without access control	The GIP-P is adding this functionality to EGDI.	Recommendation for data to which this functionality should be applied: • Specify the output format (PDF, JPG, etc.) and any specific characteristics (projections, etc.) for downloadable files and the information that should be included in them. • The data for which access control is required should be clearly highlighted, specifying whether it should be restricted to all publics or available to some users. Please, state the reason (e.g., embargo, etc.).
Identify + follow link	This functionality already exists in EDGI	

Requirements	EGDI feedback (D2.3.1)	Other information
Specific projection	Data can be uploaded to EGDI in any projection if it can be converted to EPSG:3034. EGDI would rather plot all data in EPSG:3034 for consistency.	GeoConnect³d will produce data in EPSG:3035 and EPSG:3034. GeoConnect³d has done some testing and EPSG:3034 seems to work well for their data. Hence, they do not require this functionality anymore.
Handling time component	This may need that data are delivered as WCS services with time component, so the user interface can select which time step to show.	Still under discussion, but it is likely that GeoConnect³d requires to be able to show different geological features at different times/events; e.g., when users select the layer 'Variscan orogeny', the structural framework and geomanifestations related to that orogeny will be shown. The GIP-P recommends GeoConnect³d to prepare examples of the data for which they request this functionality (including expected outputs) and send them to the GIP-P WP6 for testing.
Multiscaling	The GIP-P is adding this functionality to EGDI.	Projects must define the scale range within which each layer/object should be displayed.
Transparency	The GIP-P is adding this functionality to EGDI.	
Create simple queries and filters from the web GIS interface	The GIP-P is adding this functionality to EGDI.	
SQL query directly to the database	Access to the central EGDI database will not be allowed to the end-users.	This functionality will not be available at EGDI for safety reasons.
An upload system for the static data	The GIP-P is adding this functionality to EGDI.	
Linkage to Semantics/Project Vocabulary (link from the map to the project vocabulary and vice versa).	This will be available for all projects creating project vocabularies.	
Handling and displaying 3D models	A simple version of this functionality already exists in EDGI	GeoGonnect³d would like to show 3D models at different scales, having the possibility to zoom in and out. GeoGonnect³d will define the scale ranges within which each layer should appear.

Requirements	EGDI feedback (D2.3.1)	Other information
Transparency of 3D models	This functionality will be available at EGDI.	
Handling uncertainty	3DGEO-EU has a specific task (4.2) to define how the uncertainty of 3D models will be handled. They will produce deliverables (D4.2– 4.4) with specifications on this between M12 and M36. We will evaluate the feasibility of this functionality in D2.3.2, according to 3DGEO-EU feedbacks.	GeoConnect³d is in contact with 3DGEO-EU to decide how they would like EGDI to show uncertainties in 3D models. Concerning 2D, GeoConnect³d are going to show uncertainty as buffers (see product N°7 in Table 26).

3.10 HIKE

Products

HIKE products consist of 2D polylines/polygons archived in the European Fault Database (FDB), 3D data and reports. Data will be delivered as GeoPackages and/or by direct access via WFS archived at GSOs map servers. HIKE will also create a "Knowledge SharePoint" to share information, knowledge and preferred practices related to hazards and research impact. We describe HIKE products in Tables 29 and 30.

Table 29: spatial data that HIKE will deliver to EGDI according to information provided by the project between September and December 2019 (see also HIKE 5.1a). These products will be integrated the European FDB.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
1	2D representations of faults	polylines	HIKE's preferred format to deliver data is "GeoPackage". However, some partners may also deliver data as WFS.	direct upload to EGDI database and/or direct access via web services.	EPSG: 3034	Fault's depth will be illustrated by colour codes based on the international stratigraphic timetable. Surface Faults' traces will be in black (see HIKE D5.1a).

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
2	Faults database: Structural elements	polygons	HIKE's preferred format to deliver data is "GeoPackage". However, some partners may also deliver data as WFS.	direct upload to EGDI database and/or direct access via web services.	EPSG: 3034	Structural elements may be assigned to a specific (geological) time interval and hierarchically ordered into smaller (narrower defined) and larger-scale (broader defined) elements.
3	3D representation of Faults.	3D surfaces	Tsurf format attached to the 2D polylines as zip files ready for downloading.	undecided	EPSG: 3034	
4	Project vocabulary	N/A	Excel files	Direct upload to EGDI database	N/A	HIKE is currently working closely with the GIP-P and other Geo-energy projects to create a project vocabulary.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
5	Metadata	N/A	N/A	undecided	N/A	Metadata will not be assigned to single objects, but to spatial representations of groups of objects within territories, regions, major tectonic units or structural domains/sub-domains. Same metadata will therefore be assigned to groups of objects covering a certain area and having the same creator, data owner and contact.

Table 30: Documents and other (non-spatial) data that HIKE will deliver to EGDI according to information provided by the project between September and December 2019 (see HIKE 5.1a,b).

N°	Product	Format	Availability to EGDI	Linked to spatial data or to a location.	Other information
6	Reports on Hazard and impact assessment methodologies	PDFs	undecided. most likely, direct upload to EGDI document repository.	No	

N°	Product	Format	Availability to EGDI	Linked to spatial data or to a location.	Other information
7	HIKE Knowledge SharePoint (KSP)	See table 31.	Under discussion	Some (see Table 31)	This platform will contain links to documents and data stored in websites located in external servers. KSP must allow smart searches and be able to establish interlinks among the different entries and, in some cases, links to spatial data shown at the European FDB. It should also permit uploading documents, as well as searching through documents and websites. Links and interlinks among the different entries and to the data plotted in EGDI map viewers must be defined by the GSOs that archive information in the KSP. All documents and URLs/DOIs included in the KSP must have metadata associated (see Tables 32 and 33).

Table 31: Documents and other data that will be available through HIKE's KSP. See Tables 32 and 33 for the metadata requirements that must be met by each entry of the KSP according to HIKE's D5.1b.

Documents available through HIKE KSP	Formats	Georeferenced	Comment
Literature and Reports	PDF, DOC, PPT, ODF, TIFF, PNG, JPG, URL, DOI	No	
Non-spatial datasets (analyses, properties, etc.)	PDF, DOC, PPT, ODF, URL, DOI, TIF, PNG, JPG, XLS, CSV, XLM, Zipped files, URL, DOI	Some	
Spatial datasets (maps, etc.)	GIS files and georeferenced files archived as XLS, CSV, XLM, URL, DOI	Yes	If the GIS files must be shown in EGDI map viewers, they must also be uploaded into EGDI central database.
Presentations, Posters, factsheets	PDF, DOC, PPT, ODF, TIFF, PNG, JPG, URL, DOI	No	
Contact information for experts	PDF, DOC, PPT, ODF, XLS, CSV, XLM, URL, DOI	No	
Policy, regulations, protocols, guidelines	PDF, DOC, PPT, ODF, URL, DOI	No	
Tools, models, methods	PDF, DOC, PPT, ODF, URL, DOI, XLS, CSV, XLM, Zipped files, URL, DOI	some	

Case studies	PDF, DOC, PPT, ODF, URL, DOI, Zipped files, URL, DOI	Yes, georeferenced to study areas	
Research questions	XLS, CSV, XLM	No	

Table 32: Metadata for resource description that should be associated with every entry of HIKE's KSP according to HIKE's 5.1b.

Fields	Field type	Explanation
Dataset title	**text**	**The name of the dataset**
Date of creation/ publication/ revision	date	Date on which the dataset was created or/and published or/and revised
Edition	numeric	Edition number or reference year
Dataset abstract	text	Brief description of the dataset and/or the data it contains.
Status	text	For example, time series, snapshot data, historical archive.
Language	text	The default is English but multiple/other languages may be entered by using English terms (e.g., "German" instead of "Deutsch").
Web address	Link/text	URL if the dataset can be found in electronic format
Contact information	text	For example, contact organization and address
Frequency of update	Text	For example, annual, six-monthly, monthly, weekly
Geographical coverage	text	For example, a continent, region, individual country
Temporal extent	text	For example, historic times, present, future etc.
Temporal extent - numeric	numeric	Temporal extend in greater detail; e.g., "1990-2003"
Dataset themes – Linked to Ontology Concepts	Keywords / search categories	A list of different themes is available and the most relevant ones to the described dataset are selected. keywords / search categories refer to GIP-P's keyword thesaurus and search categories provided in GIP-P deliverable D4.2.
Information or data class	text	For example, general descriptive information (reports, websites), spatial data, statistical data, metadata, other information (software models, infographics)

Fields	Field type	Explanation
Information or data type	text	For example, dataset (e.g., an inventory, database or compilation of data), series (e.g., a collection of maps), an individual item (e.g., website, paper)
Access	text	For example, access to a resource may be available for free for all purposes, available for free for non-commercial purposes, available upon registration only and so on.
Confidentiality	text	This field provides information about confidentiality or issues that may exist with a specified resource.
Limitations	text	It includes information about additional limitations and legal constraints that may apply.

Table 33: Metadata for resource discovery that should be associated with every HIKE KSP entry according to HIKE 5.1b.

Fields	Field type	Explanation
Requirement for data generation	text	For example, legal, voluntary, other
Date record created	date	Date that the metadata record was created
Record created by	Text	Name of the individual and organisation who created the record
Date record reviewed by Approved by	Date	This information is completed by the reviewer only
Method of data or information generation	Keywords (from thesaurus compiled by GIP-P/WP4)	Depending on the data class selected in the previous section of the template (Table 32), a list of potential methods of data/information generation is presented. For example, for general descriptive information, the method may be academic research or expert consultation. For spatial data, the method of data generation may include GIS, digitised paper maps, direct measurements, interpolating from point data etc.
Purpose of data or information generation	text	Provides a description of the reasons behind the data/information generated.

Fields	Field type	Explanation
Data quality and uncertainty – Questions	Boolean (yes, no, unknown)	To capture information on data quality and uncertainty is not a straightforward task. Following several trials with different datasets, it was decided that the incorporation of questions may capture essential information during the data gathering process. The following questions were included in the template: - Are data or information generation methods formally described? - Are quality assurance procedures described? - Are any uncertainty measures provided (e.g. standard error, confidence interval)? Standard answers (yes, no, unknown) are provided to these questions.
Data quality information	text	Depending on the data class selected, a distinct list of descriptions on data quality is presented. For example, for spatial data the following descriptions are available: • Information provided on possible sources of digitisation error. • Information provided to quantify uncertainty. • No information provided on the quality of the spatial data.

Functionalities: required vs. EGDI expected extension

In this section, we provide an update on the requirements that HIKE has made in terms of functionalities and on the feedbacks provided by EGDI on this regard.

Apart from the functionalities discussed below, HIKE also requires that the European FDB will be linked to other fault databases by establishing links to GIS services (preferred) or to their webGIS portals. These databases are: SHARE database (EDSF), Italian Fault Database (DISS), Austrian Fault Database and OneGeology.

Table 34: Functionalities required by HIKE and feedbacks provided by EGDI (D2.3.1).

Requirements	EGDI feedback (D2.3.1)	Other information
Search Documents	This will be implemented in EGDI by creating the following functionalities: searching through metadata, datasets and documents directly from the EGDI portal; Searching through documents; and ranking results based on relevance.	If the Knowledge SharePoint is included into EGDI document repository, this functionality will be needed.
Interface to upload and thematize shapefiles and GeoPackages	The GIP-P is adding this functionality to EGDI.	

Requirements	EGDI feedback (D2.3.1)	Other information
Interface to knowledge base and related documents	The GIP-P is in contact with HIKE to see who to create this interface.	This requirement depends on whether HIKE and the GIP-P decide to include HIKE KSP as part of EGDI document repository or as an independent platform to which EGDI should be linked to.
Web page with all services	The GIP-P is adding this functionality to EGDI.	The web page will comprise a list of all services, including both the services directly available from EGDI platform and those drawn from the thematic projects.
Download data (+ access control)	The GIP-P is adding this functionality to EGDI.	Recommendation for data to which this functionality should be applied: • Specify the output format (PDF, JPG, etc.) and any specific characteristics (projections, etc.) for downloadable files and the information that should be included in them. • The data for which access control is required should be clearly highlighted, specifying whether it should be restricted to all publics or available to some users. Please, state the reason (e.g., embargo, etc.).
Identify + follow link	This functionality already exists in EDGI	
Multiscaling	The GIP-P is adding this functionality to EGDI.	For each fault geometry, there will be attributes defining the scale to which they should be displayed (ScaleFrom / ScaleTo). Details are described in HIKE D5.1a.
Creation of statistical diagrams, rose diagrams, histograms…	EGDI will be able to generate statistical diagrams.	The European FDB will have certain attributes (e.g., dip angle, dip direction, length, strike) for which it will be possible to build rose diagrams based on a selection the user will make. Note that these attributes do not have numeric values, but are sorted into predefined classes, these classes should be used for the display of statistical diagrams. For the other attributes, such as fault length, EGDI will be able to create standard histograms based on users selections (see Figure 1 for more details).

Requirements	EGDI feedback (D2.3.1)	Other information
Create simple queries and filters from the web GIS interface	The GIP-P is adding this functionality to EGDI.	There should be filtering mechanisms to show faults based on their age and other information included in the attributes. All types: numerical (min-max values), specific attribute values in a domain, hierarchical search for geological times (Stratigraphic timetable) / geological units (if available).
An upload system for the static data	The GIP-P is adding this functionality to EGDI.	
A common legend should be applied to all datasets based on attributes given in the fault attribute tables. The default colouring of subsurface faults will correspond to the colour coding of the International Chronostratigraphic Chart v2018/08.	For each layer shown in EGDI there can be either an auto generated legend or a legend as an image supplied during set up.	
Linkage to Semantics/Project Vocabulary (link from the map to the project vocabulary and vice versa).	This will be available for all projects creating project vocabularies.	
Customizing classifications and legends to certain purpose. For example, show proven faults in solid lines, assumed faults in dashed lines and/or a certain depth as line thickness.	Normally, representing layers/objects with different colours and/or different symbols should be possible in EGDI. However, HIKE will have to provide clear information stating the symbols that EGD should use to represent the parameters included in the attributes that provide information on certainty, depth, etc.	
Predefined views with predefined classifications (time slices)	This is a new request (December 2019). We will evaluate its feasibility in D2.3.2.	We recommend HIKE to send examples to the GIP-P providing details on how this functionality should work according to them.

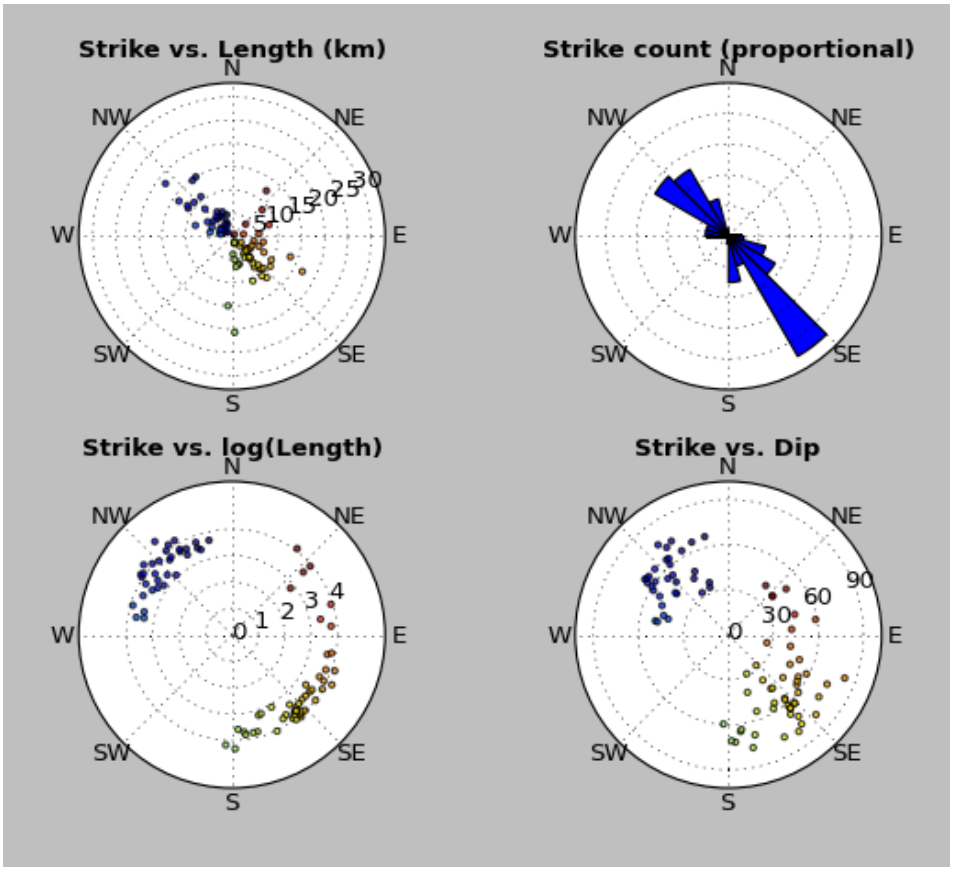

Figure 1 : Example of rose diagrams as requested by HIKE. Rose diagrams located in the upper left and lower right and left corners show the relation between the direction of a fault (strike) and other numerical attributes of the fault, like length, dip angle or maximum displacement. Rose diagram in upper right corner of the image above shows the number of faults within some selection or area plotted in classification for the direction of the fault. Note that a logarithmic scale should be use for length or maximum displacement (Rose diagrams example in lower left corner of image above).

3.11 3DGEO-EU

Products

3DGEO-EU will deliver 14 products on geological structures and natural hazards (see Tables 35 and 36). Note that the spatial data will be accompanied by excel files with descriptions of the attributes associated with them.

3DGEO-EU is not creating a project vocabulary. They will use the one from HIKE, as 3DGEO-EU is sharing information with HIKE (there is a 3DGEO-EU – HIKE interface WP in 3DGEO-EU). Note that, in a later stage of the project, 3DGEOEU may decide to create their own version of a project vocabulary.

Due to the relationship between 3DGEO-EU and HIKE it may be useful, although not mandatory, to have HIKE FDB accessible via the 3DGEO-EU map viewer.

Table 35: Spatial data that 3DGEO-EU will deliver to EGDI according to information provided by the project between September and December 2019.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
1	2.5D Time model	2.5D grids	CPS3 ASCII, Gocad ASCII (TSurf or 2.5D Grids)	Direct upload to EGDI database	EPSG: 23031	
2	2.5D Velocity maps	2.5D grids	CPS3 ASCII Or ESRI Raster graphics	Direct upload to EGDI database	EPSG: 23031	
3	2D Maps of Cenozoic reservoirs	Vector	ESRI Shapefile	Direct upload to EGDI database	EPSG: 3035	This product is still under discussion.
4	2D Map of extent and depth of salt/fresh groundwater barrier	Vector	ESRI Shapefile	Direct upload to EGDI database	EPSG: 3035	This product is still under discussion.
5	Geothermal properties related to wells (porosity & permeability) + 2D Geothermal property maps	Vector or raster	ESRI Shapefile or ESRI Raster	Direct upload to EGDI database	EPSG: 3035	This product is still under discussion.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
6	Polygons/polylines/Points defining extent of 3D models in 2D maps	Vector	ESRI Shapefile	Direct upload to EGDI database	EPSG: 23031 or 3035	
7	3D Structural model	3D	Gocad ASCII (TSurf)	Direct upload to EGDI database	EPSG: 23031	
8	3D Harmonized model of lithostratigraphic layers	3D	Gocad ASCII format	Direct upload to EGDI database	EPSG: 3035	
9	Example datasets and models containing uncertainty information	3D	GOCAD ASCII (TSurf, PLine, VSet, Solid, Voxet, SGrid) Or VTK ASCII (XML or legacy)	Direct upload to EGDI database	EPSG: 23031, possibly local (no CRS)	These datasets will be accompanied by additional data on vertices or primitives, which could be scalars, vectors or tensors (4-componet or 9-component vectors).
10	Project vocabulary	N/A	Excel files	Direct upload to EGDI database	N/A	3DGEO-EU will use HIKE's project vocabulary.
11	Metadata	N/A	N/A	Direct editing in MiCKA metadata base	N/A	

Table 36: Documents and other (non-spatial) data that 3DGEO-EU will deliver to EGDI according to information provided by the project between September and December 2019.

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
11	Explicative reports of spatial data and fact sheets	PDFs	Direct upload to document repository?	Yes	These reports are supporting documents, which will be provided for several products (models, maps or digital data). These documents will describe the models/data; e.g., by providing descriptions of the attributes associated with them.
12	Methodology and best practice reports	PDFs	Direct upload to document repository	No	
13	Reports on studied cases	PDFs	Direct upload to document repository	Yes	
14	Reports on harmonization procedure	PDFs	Direct upload to document repository	No	

Functionalities: required vs. EGDI expected extension

In this section, we provide an update on the requirements that 3DGEO-EU has made in terms of functionalities and on the feedbacks provided by EGDI on this regard.

Table 37: Functionalities required by 3DGEO-EU and feedbacks provided by EGDI (D2.3.1).

Requirements	EGDI feedback (D2.3.1)	Other information
Search Documents	This will be implemented in EGDI by creating the following functionalities: searching through metadata, datasets and documents directly from the EGDI portal; Searching through documents; and ranking results based on relevance.	The GIP-P recommends uploading all documents to EGDI document repository (see section 2.2).

Requirements	EGDI feedback (D2.3.1)	Other information
Overview panel	A simple version of this functionality already exists in EDGI	
Legend with tree view / hierarchical on/off switching	The GIP-P is adding this functionality to EGDI.	
Export map	EGDI will be able to export all elements plotted in map viewers as high-resolution images.	
Download data with or without access control	The GIP-P is adding this functionality to EGDI.	Recommendation for data to which this functionality should be applied: • Specify the output format (PDF, JPG, etc.) and any specific characteristics (projections, etc.) for downloadable files and the information that should be included in them. • The data for which access control is required should be clearly highlighted, specifying whether it should be restricted to all publics or available to some users. Please, state the reason (e.g., embargo, etc.).
Multiscaling	The GIP-P is adding this functionality to EGDI.	Projects must define the scale range within which each layer/object should be displayed.
Create virtual cross section from 2.5D layers from a user defined geometry	The GIP-P is adding this functionality to EGDI.	
Linkage to Semantics/Project Vocabulary (link from the map to the project vocabulary and vice versa)	This will be available for all projects creating project vocabularies.	
Handling and displaying 3D models	A simple version of this functionality already exists in EDGI.	
Transparency of 3D models	The GIP-P is adding this functionality to EGDI.	
Virtual borehole	This should be possible in EGDI 3D viewer.	

Requirements	EGDI feedback (D2.3.1)	Other information
Virtual cross section	This should be possible in EGDI 3D viewer.	
Virtual (horizontal) slice	This should be possible in EGDI 3D viewer.	
Handling uncertainty	3DGEO-EU has a specific task (4.2) to define how the uncertainty of 3D models should be handled. They will produce deliverables (D4.2–4.4) with specifications on this between M12 and M36. The GIP-P will evaluate the feasibility of this functionality in D2.3.2, according to 3DGEO-EU feedbacks.	
Visualization of data with scalar uncertainty, using 2D colour maps.	This is a new requirement (December 2019). Its feasibility will be discussed in D2.3.2.	A description of how this could be done has already been provided to the GIP-P (3DGEO-EU deliverable D4.3).
Visualization of different representations of an object (e.g., a surface) showing different realizations; for example, the mean surface and additional 90% and 95% confidence envelopes as transparent surfaces.	This is a new requirement (December 2019). Its feasibility will be discussed in D2.3.2.	This is a request regarding the user interface. Different representations of the same horizon or the mean horizon and its confidence envelope should be grouped in the tree view and it should be possible to either switch them on/off together or individually.
Storing data with uncertainty in the 3D database	This is possible in the extended EGDI 3D database.	3D models have additional data on vertices or geometric primitives (e.g., triangles, quadrangles), which could be scalars (e.g., standard deviation), vectors (possible displacement direction or surface normal) or tensors (non-isotropic standard deviation, stored as 4-component or 9-component vectors).
Compass	This should be possible in EGDI 3D viewer.	

Requirements	EGDI feedback (D2.3.1)	Other information
Colour / Alpha mapping functions to render attributes	This should be possible in EGDI 3D viewer.	
Glyphs for data representation	This functionality can be handled in some amount.	3DGEO-EU and GIP-P/WP6 should work together to define this functionality. Examples must be sent for testing as soon as they are ready.
Visualization of different models at same time	It should be possible to visualize two models simultaneously in two separate windows. However, it may not be possible to visualise them in the same viewer.	
Possibility to display objects	The EGDI 3D model database can store points, surfaces and closed volumes. We need however to have examples of what 3DGEO-EU will generate and how they expect to have them visualised.	
Grid lines	This functionality will exist in EGDI 3D viewer.	
Exploded views of detailed part of 3D model	This should be possible in EGDI 3D viewer.	
Show camera direction	This should be possible in EGDI 3D viewer.	
API to extend the viewer	Too complex to create it in the timeframe of GeoERA.	This functionality will not be added to EGDI.
Fly through (recordable)	Too complex to create it in the timeframe of GeoERA. It will however be possible to upload videos showing models generated by professional modelling tools.	This functionality will not be added to EGDI.
Steering camera via geocoded locations	Too complex to create it in the timeframe of GeoERA.	This functionality will not be added to EGDI.

Requirements	EGDI feedback (D2.3.1)	Other information
Predefined viewpoints	Too complex to create it in the timeframe of GeoERA.	This functionality will not be added to EGDI.

3.12 MUSE

Products

MUSE will generate a number of products, comprising spatial data and documents on shallow geothermal exploration and use from several cities of Europe. We describe these products in Tables 38 and 39. Some of MUSE's partners are discussing the possibility of also producing 3D data. We have however not included 3D data in the list of products listed in Table 38, since the latest information we had from the project do not mention that product.

The list of products provided in Tables 38 and 39 is not exhaustive; i.e., some of the products included in them may not be delivered or may change in the future. MUSE will finalize the definition of products by testing examples in EGDI.

Table 38: Spatial data that MUSE will deliver to EGDI according to information provided by the project in December 2019.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
1	Specific annual thermal load (closed systems)	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
2	Outline of groundwater bodies suitable for open loop systems	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
3	Specific annual thermal load - open systems	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
4	Anthropogenic lines: Linear infrastructure (electricity, pipelines, …)	vector	Shapefiles or GeoPackages	Direct upload to EGDI database	EPSG:3034	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
5	Areas suited for groundwater disposal to surface waters or municipal drains	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
6	Average subsurface temperature	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
7	Average temperature	vector	Shapefiles or GeoPackages	Direct upload to EGDI database	EPSG:3034	
8	Bulk thermal conductivity (for a specific depth interval)	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
9	Decision support map for the use of shallow geothermal technologies	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
10	Dept to water table	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
11	Effective groundwater temperature	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
12	Existing geological profiles and cross-sections	vector	Shapefiles or GeoPackages	Direct upload to EGDI database	EPSG:3034	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
13	Existing subsurface infrastructure	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
14	Fault systems	vector	Shapefiles or GeoPackages	Direct upload to EGDI database	EPSG:3034	
15	field thermal conductivity	vector	Shapefiles or GeoPackages	Direct upload to EGDI database	EPSG:3034	
16	Flood risk	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
17	geothermal energy potential	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
18	Groundwater temperature	raster and vector (points)	Undefined	Direct upload to EGDI database	EPSG:3034	
19	Groundwater zones of problematic chemistry	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
20	Heat transfer rate	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
21	Hydraulic conductivity	raster	Undefined	Direct upload to EGDI database	EPSG:3034	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
22	Hydraulic productivity	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
23	Hydraulic transmissivity	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
24	Hydraulically separated groundwater bodies	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
25	Interval thermal conductivities derived from TRT measurements	vector	Shapefiles or GeoPackages	Direct upload to EGDI database	EPSG:3034	
26	Karst areas including cavities	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
27	karst features	vector	Shapefiles or GeoPackages	Direct upload to EGDI database	EPSG:3034	
28	Landfills, contaminated areas	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
29	Landslides	vector	Shapefiles or GeoPackages	Direct upload to EGDI database	EPSG:3034	
30	Lithology of a specific geological unit	raster	Undefined	Direct upload to EGDI database	EPSG:3034	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
31	Location of existing geothermal utilizations	vector	Shapefiles or GeoPackages	Direct upload to EGDI database	EPSG:3034	
32	Location of existing other groundwater use than for geothermal reasons	vector	Shapefiles or GeoPackages	Direct upload to EGDI database	EPSG:3034	
33	Mining areas	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
34	Natural reserves and protection areas	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
35	Net aquifer thickness	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
36	Outline of groundwater bodies suitable for Aquifer Thermal Energy Storage (ATES)	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
37	Overpressured or artesian groundwater areas	raster	Undefined	Direct upload to EGDI database	EPSG:3034	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
38	Specific thermal capacity - closed loop systems	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
39	Specific thermal capacity - open loop systems	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
40	Specific yield	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
41	Subsurface temperature profiles	vector	Shapefiles or GeoPackages	Direct upload to EGDI database	EPSG:3034	
42	Surface temperature	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
43	temperature at different depths in boreholes	vector	Shapefiles or GeoPackages	Direct upload to EGDI database	EPSG:3034	
44	Temperature gradient	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
45	Thermal conductivity of unsaturated sediments	vector	Shapefiles or GeoPackages	Direct upload to EGDI database	EPSG:3034	
46	Thermal productivity	raster	Undefined	Direct upload to EGDI database	EPSG:3034	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
47	Top of a geological unit	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
48	Traffic light map closed loop system	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
49	Traffic light map open loop system	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
50	Water level	vector	Shapefiles or GeoPackages	Direct upload to EGDI database	EPSG:3034	
51	Water protection zones	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
52	Aquifer pressure	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
53	Electrical conductivity (average)	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
54	Recharge Capacity Index	raster	Undefined	Direct upload to EGDI database	EPSG:3034	
55	Zones with restrictions to drilling	raster	Undefined	Direct upload to EGDI database	EPSG:3034	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
56	Project vocabulary	N/A	Excel file	Direct upload to EGDI database	N/A	MUSE is creating a project vocabulary, as many of the parameters included in their products are not defined in INSPIRE.
57	Metadata	N/A	N/A	Under discussion, possibly, direct edition at MiCKA.	N/A	

Table 39: Documents and other (non-spatial) data that MUSE will deliver to EGDI according to D2.2.1 and information provided by the project between April and October 2019.

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
58	Reports on Technical aspects of shallow geothermal energy use in urban areas.	PDFs	Direct upload to document repository	No	
59	Reports on Management strategies and action plans for a sustainable and efficient use of shallow geothermal energy	PDFs	Direct upload to document repository	No	
60	Reports on testing and implementation of developed methods and workflows in urban pilot areas across Europe and structural uncertainty in 3D models	PDFs	Direct upload to document repository	Yes	

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
61	Fact sheets	PDF	Direct upload to document repository	Yes	
62	Short abstracts of papers and reports, containing important information for shallow geothermal exploration and use. Each of these abstracts should be searchable and linked to the pertinent URL or DOIs, as well as to the spatial data shown in the map viewers.	PDFs and DOIs	Direct upload to document repository	Some	

Functionalities: required vs. EGDI expected extension

In this section, we provide an update on the requirements that MUSE has made in terms of functionalities and on the feedbacks provided by EGDI on this regard.

Table 40: Functionalities required by MUSE and feedbacks provided by EGDI (D2.3.1).

Requirements	EGDI feedback (D2.3.1)	Other information
Search based on location	The GIP-P is adding this functionality to EGDI. Searches by coordinates will be performed by using geographic coordinates (latitude/longitude).	
Interface to upload and thematize shapefiles and GeoPackages	This has already been implemented in EGDI.	
Web page with all services	The GIP-P is adding this functionality to EGDI.	
Legend with tree view / hierarchical on/off switching	The GIP-P is adding this functionality to EGDI.	According to MUSE D5.1, MUSE requires a tool to activate/deactivate layers; thus, the pertinence of this functionality.
Export map	The GIP-P is adding this functionality to EGDI.	Data should be downloadable in digital georeferenced format

Requirements	EGDI feedback (D2.3.1)	Other information
Download data with or without access control	The GIP-P is adding this functionality to EGDI.	Recommendation for data to which this functionality should be applied: • Specify the output format (PDF, JPG, etc.) and any specific characteristics (projections, etc.) for downloadable files and the information that should be included in them. • The data for which access control is required should be clearly highlighted, specifying whether it should be restricted to all publics or available to some users. Please, state the reason (e.g., embargo, etc.).
Identify + follow link	This functionality already exists in EDGI	
Multiscaling	The GIP-P is adding this functionality to EGDI.	MUSE must define the scale range within which each layer/object should be displayed.
Transparency	The GIP-P is adding this functionality to EGDI.	According to MUSE D5.1, MUSE requires a tool to have “variable transparency of layers”.
Create simple queries and filters from the webGIS interface	The GIP-P is adding this functionality to EGDI.	
An upload system for the static data	This functionality will be available at EGDI.	
From getfeatureinfo creation of an automatic report querying a selection of layers.	A simple version of this functionality already exists in EGDI. The GIP-P is currently updating it based on specifications from MUSE.	When providing the data to EGDI, please, specify the layers to which this functionality should be applied and the attributes, tables, etc., from where the data included in the reports should come from.
Virtual borehole	This functionality will be available at EGDI.	
Annotation and explanatory notes referring to web data layers shown via pop-up windows.	This can be achieved via a project vocabulary or by archiving this information in documents stored at EGDI document repository and establishing links to them.	

3.13 HotLime

Products

HotLime will generate information on the potential of carbonate basins for deep geothermal energy from 10 case studies across Europe. The latest information available on the products that HotLime will deliver to EGDI is included in GIP-P D2.2.1 and D2.1.1. HotLime is still defining the products that they will deliver. They will provide an update in January–February 2020. This chapter will therefore be updated as soon as more information is available.

From recent email exchanges and conference calls between the GIP-P and HotLime, we gathered that HotLime will deliver 2D and 2.5D vector and raster data, 3D surfaces and models and several reports. All data will be directly uploaded to EGDI spatial database and document repository. In the same way, metadata will be filled out directly into MiCKA metadatabase. Note that HotLime will provide only 1 metadata file for each 3D model. They will also furnish only 1 metadata file for each thematic map series of case study areas, independently of how many single maps are comprised in each series. That is so because the information included in the metadata will be the same for all maps produced from the same area. Thematic map series and 3D models with the same areal coverage, author, contact, etc. must be treated as one "product" for Metadata purposes.

HotLime is working closely with HIKE and the GIP-P to create a project vocabulary. Faults from the European FDB will be an integral component of HotLime's spatial data. Hence, links should be established between the fault objects shown in HotLime map viewer and HIKE fault database, as well as between HotLime's project vocabulary on "Tectonic Boundaries Objects" and that of HIKE.

Functionalities: required vs. EGDI expected extension

In this section, we provide an update on the requirements that HotLime has made in terms of functionalities and on the feedbacks provided by EGDI on this regard.

Table 41: Functionalities required by HotLime and feedbacks provided by EGDI (D2.3.1).

Requirements	EGDI feedback (D2.3.1)	Other information
Search Documents	This will be implemented in EGDI by creating the following functionalities: searching through metadata, datasets and documents directly from the EGDI portal; Searching through documents; and ranking results based on relevance.	The GIP-P recommends uploading all documents into EGDI document repository (see section 2.2).
Interface to upload and thematize Shapefiles and GeoPackages	This is already implemented in EGDI.	

Requirements	EGDI feedback (D2.3.1)	Other information
Download data with or without access control	The GIP-P is adding this functionality to EGDI.	Recommendation for data to which this functionality should be applied: • Specify the output format (PDF, JPG, etc.) and any specific characteristics (projections, etc.) for downloadable files and the information that should be included in them. • The data for which access control is required should be clearly highlighted, specifying whether it should be restricted to all publics or available to some users. Please, state the reason (e.g., embargo, etc.).
Identify + follow link	This functionality already exists in EDGI	
Create simple queries and filters from the web GIS interface	The GIP-P is adding this functionality to EGDI.	
From getfeatureinfo creation of an automatic report querying a selection of layers	A simple version of this functionality already exists at EGDI. The GIP-P is currently updating it.	specify the layers to which this functionality should be applied and the attributes, tables, etc., from where the data included in the reports should come from.
Linkage to Semantics/Project Vocabulary (link from the map to the project vocabulary and vice versa).	This will be available for all projects creating project vocabularies.	
Handling and displaying 3D models	Simple versions of these functionalities will be available in the final version of EGDI 3D database/viewer	
Virtual borehole (from 3D data)		
Virtual cross section (from 3D data)		
Virtual (horizontal) slice (from 3D data)		
Exploded views of detailed part of 3D model		

Requirements	EGDI feedback (D2.3.1)	Other information
In 3D viewer: "getfeatureinfo" tool that displays information on each layer when the users click on them.		

3.14 GARAH

Products

GARAH will generate 16 spatial products and several reports, providing information on oil and gas resources in Europe. The various products that GARAH will submit to EGDI are listed in Tables 42 and 43. Note that GARAH is still defining some of the products listed in these tables are.

Table 42: spatial data that GARAH will deliver to EGDI according to information provided by the project in April 2019, which has been updated with new information provided in September and December 2019.

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
1	Basin outline	Vector	Shapefile	Direct upload to EGDI database	EPSG:3034	
2	Formation outline	Vector	Shapefile	Direct upload to EGDI database	EPSG:3034	
3	Play outline	Vector	Shapefile	Direct upload to EGDI database	EPSG:3034	
4	Exploration wells	Vector	Shapefile	Direct upload to EGDI database	EPSG:3034	
5	Hydrocarbon fields	Vector	Shapefile	Direct upload to EGDI database	EPSG:3034	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
5	2D Faults	Vector	Shapefile	Direct upload to EGDI database	EPSG:3034	Recommendation: crosscheck fault information with HIKE and 3DGEO-EU.
6	Geothermal gradients	Vector	Shapefile	Direct upload to EGDI database	EPSG:3034	
7	Seafloor temperature (points)	Vector	Shapefile	Direct upload to EGDI database	EPSG:3034	
8	Gas hydrates below seafloor (points)	Vector	Shapefile	Direct upload to EGDI database	EPSG:3034	
9	Gas hydrates below seafloor	Vector	Shapefile	Direct upload to EGDI database	EPSG:3034	
10	Gas stability map	Vector	Shapefile	Direct upload to EGDI database	EPSG:3034	
11	2D Horizon interpretations	Vector	Shapefile	Direct upload to EGDI database	EPSG:3034	
12	Fishing activities	Vector	Under discussion. Possibly, Shapefile.	Direct upload to EGDI database	EPSG:3034	

N°	Product	Type	Format	Delivered by	Projection (delivery)	Other information
13	3D models	3D volumes	GARAH will generate the same types of 3D volumes than 3DGEO-EU (see Table 35).	Direct upload to EGDI 3D database	EPSG:3034	
14	3D surfaces (e.g., faults)	Grids	2.5D Grids (ASCII)	Direct upload to EGDI 3D database	EPSG:3034	These data will be generated with Petrel and deliver to EGDI as 2.5D ASCII grids.
15	Metadata	N/A	N/A	Direct editing in MiCKA meta-database	N/A	
16	Project vocabulary?	Excel files	N/A	Direct upload to EGDI database	N/A	GARAH is discussing the pertinence of creating a project vocabulary. Recommendation: work closely with 3DGEO-EU, HIKE and the GIP-P on this matter. There may be some overlap among the concepts and parameters GARAH, 3DGEO-EU and HIKE are defining.

Table 43: Documents and other (non-spatial) data that GARAH will deliver to EGDI according to information provided by the project in October 2018 (see D 2.2.1).

N°	Product	Formats	Availability to EGDI	Linked to spatial data or to a location.	Other information
17	Reports	PDFs	Direct upload to EGDI document repository	some	The number of reports and their contents have not been defined yet.

Functionalities: required vs. EGDI expected extension

In this section, we provide an update on the requirements that GARAH has made in terms of functionalities and on the feedbacks provided by EGDI on this regard.

Table 44 : Functionalities required by GARAH and feedbacks provided by EGDI (D2.3.1).

Requirements	EGDI feedback (D2.3.1)	Other information
Interface to upload and thematize Shapefiles/GeoPackages	This is already implemented in EGDI.	
Web page with all services	The GIP-P is adding this functionality to EGDI.	The web page will comprise a list of all services, including both the services directly available from EGDI platform and those drawn from the thematic projects.
Overview panel	A simple version of this functionality already exists in EDGI	
Export map	EGDI will be able to export all elements plotted in map viewers as high-resolution images.	
Download data with or without access control	The GIP-P is adding this functionality to EGDI.	Recommendation for data to which this functionality should be applied: • Specify the output format (PDF, JPG, etc.) and any specific characteristics (projections, etc.) for downloadable files and the information that should be included in them. • The data for which access control is required should be clearly highlighted, specifying whether it should be restricted to all publics or available to some users. Please, state the reason (e.g., embargo, etc.).

Requirements	EGDI feedback (D2.3.1)	Other information
Identify + follow link	This functionality already exists in EDGI	
Create simple queries and filters from the web GIS interface	The GIP-P is adding this functionality to EGDI.	
Handling and displaying 3D models	A simple version of this functionality already exists in EDGI.	Part of the data GARAH will generate will be produced in collaboration with 3DGEO-EU. Hence, GARAH will require similar 3D functionalities than those required by the 3DGEO-EU project (see Table 37).

4 OTHER INFORMATION

- The GIP-P can help the projects to choose and create adequate GIS formats and/or web services to share their data with EGDI. Projects can require assistance by contacting GIP-P WP8 (support@geoera.eu). WP8 can also be contacted if projects need assistance matching their textual attributes with international standards (see https://geoera.eu/wp-content/uploads/2019/07/D8.3.1-A-support-network.pdf). To assure a good understanding between the GSPs and the GIP-P on the formats, data models, etc., the GIP-P recommends that all GSPs send real examples of each datatype they intend to deliver with their attributes filled out to WP8.
- The GIP-P is ready to start testing products and new EGDI functionalities. By testing specific data formats and functionalities, the GIP-P will be able to better understand the requirements made by the various projects, thus accurately adapting EGDI to the specific needs of GeoERA. Projects are thus invited to send examples to GIP-P WP6 for testing.
- Ideally, 2D and 3D data should be mapped by applying common standards, thus making data comparable across EGDI. That is, the visualization must follow mandatory stipulations for rendering schemes; i.e., the use of uniform legends for each topic displayed. These rules should be set up by the GIP-P in cooperation with the GeoERA themes' coordinators by considering existing standards and specifications for all topics common to GSPs. Examples are:
    - for chronostratigraphic subdivision: the colour codes defined in of the International Chronostratigraphic Chart http://www.stratigraphy.org/ICSchart/ChronostratChart2018-08.pdf,
    - for hydrogeological classifications: the standard legend of Struckmeier and Margat (1995): Hydrogeological Maps – A Guide and a Standard Legend,
    - for the spatial distribution of subsurface temperatures: a colour shade ramp covering the temperature interval from 5°C to 200°C, like the one commonly used for geothermal classifications, for example, in the North Alpine Molasse Basin (Agemar and Tribbensee 2018).

  However, deviating subdivisions might be necessary for clarity. In addition, international standards used for some parameters may not be applicable to others; e.g., the

temperature distribution in geothermal products may not be applicable to hydrogeological ones. Thus, a solution should be considered that allows the use of both global (standardized) schemes and particular/local/regional schemes, and to toggle between both. The GIP-P will investigate how to address this issue together with the GSPs during the full development phase of GeoERA.

- During a workshop that FRAME held in September 2019, they decided to create a exchange platform where GeoERA projects can promote good practices, tackle implementation and technical issues related to data set harmonization and harvesting processes or simply for sharing experiences. This platform consists of a forum and a support repository. The FORUM can be accessed at https://github.com/orgs/GeoEra-GIP/teams/raw-materials; and the repository at: https://github.com/GeoEra-GIP/raw-materials. If some projects want to get access to these platforms, they should request an invitation to FRAME.

REFERENCES

3DGEO-EU deliverable D4.3: Documentation of requirements for the visualization of uncertainties in geomodels which can be used as input for EGDI. December 2019 (PM18).

FRAME deliverable D8.1: Deliver, in conjunction with the central GeoERA Information Platform, a norm for data format and delivery. July 2019 (PM13)

GIP-P deliverable D 2.2.1: First report describing the requirements to the Information Platform by the Geo-energy, Groundwater and Raw Materials themes. January 2019

GIP-P deliverable D 2.3.1: First report mapping and describing the needed extensions to EGDI directly related to the task 2.2. March 2019 (PM9).

GIP-P deliverable D 2.1.1: First report highlighting the potential synergies and overlaps between the projects in terms of geoinformation. June 2019 (PM12).

GIP-P deliverable D4.2: Keyword Thesaurus. October 2016 (PM16).

GIP-P deliverable D4.3: GeoERA project vocabulary. October 2016 (PM16).

HIKE deliverable D5.1a: EU Fault Database Technical Specifications. July 2019 (PM13).

HIKE deliverable D5.1b: Knowledge Sharepoint Technical Specifications. July 2019 (PM13).

HotLime deliverable D 7.1.1: Specifications and technical requirements for the EGDI spatial data repository. Version 2. August 2019 (PM14).

HOVER D.6-1b: A classification system based on groundwater age distributions defining shallow and deep aquifer vulnerability classes indicating the risk of pollution and elevated concentrations of geogenic elements. June 2019 (PM12)

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VoGERA deliverable D2.2 Definition of prioritized Information Products for the GeoERA Information Platform. October 2019 (PM16)