EUROLITHOS European Ornamental Stone Resources

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Deliverable D3.1

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

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EXECUTIVE SUMMARY

The Work package 3 - Atlas of European Ornamental Stones, from the Eurolithos project, aims to establish the framework and develop a first edition of an Atlas of European Ornamental Stones, and its integration in the GeoEra Information Platform. This report is the Deliverable 3.1. It responds to tasks T3.1 and T3.2 by providing a summary of the spatial data available in each country partner regarding the provenance of the respective ornamental stones, as well as by presenting the requirements and guidelines for the Atlas to be addressed and followed by the Information Platform and Eurolithos partners.

As regards the extraction place for each ornamental stone type, 13 out of 14 partners (13 countries, including Italy, plus one region of Italy) have geographical data on the quarries from which the stones were or are extracted, and 8 are able to provide polygons for quarrying areas. With regard to the geological coverage of extraction sites, map availability is uneven among partners. The more coeherent results refer to small scales: 8 out 13 countries refer a full coverage of sites at scales smaller than 1/250.000. With a direct relationship with the available geological maps, most of the partners have formal descriptions for the geologic unit of origin of the stones, which, depending on the scale, may correspond to a geological province of provenance.

Regarding the main attributes to be considered for the Atlas, the following requirements and guidelines should be addressed:

- **Requeriment 1**- Use the trading name of each ornamental stone as *unique object identifier* in the database.
  - **Guideline 1**- Alternative trading names for the ornamental stones should be included in the database.
  - **Guideline 2**- Give priority to ornamental stones included in EN-12440.
- **Requeriment 2**- The colour of each stone is a main attributes to be considered in the Atlas database.
  - **Guideline 3**- Use simple colour names instead of the fancy names that sometimes are used for the compound name of the stones.
- **Requeriment 3**- Remarkable uses of ornamental stones is one attribute to be considered in the Atlas database.
  - **Guideline 4**- For each use, a brief description and at least one photo should be associated.

Regarding spatial data on the provenance of each stone, the following requirements and guidelines:

- **Requirement 4**- Each provenance site relates to two types of spatial data: the extraction site itself and the geology.
- **Requirement 5**- The Atlas should allow for various types of spatial representation of the sites of origin of the stones: quarries, quarrying areas, known deposits, prospects, and quarry provinces.

- **Guideline 5**- For quarries, the type of mining operation should be indicated (open pit or underground).
- **Guideline 6**- When needed, spatial data concerning areas may be represented by centroids.
- **Guideline 7**- Include provenance places from which stones come with non-standard names, as long as these stones are identical to others listed in EN-12440.

- **Requirement 6**- The activity status of the provenance sites is an attribute to be considered in the Atlas database.
  - **Guideline 8**- It is desirable for the Atlas to show the geology of the extraction sites according to the map scales available in each country. The productive geological unit should be highlighted
- **Requirement 7**- The Atlas should display polygons or, less desirable, centroids, representing quarry provinces, known deposits and prospects with the associated geological information (lithology and age).
- **Requirement 8**- The Atlas should provide qualitative information on the availability of resources according to two distinct aspects: importance of the deposit and risk of sterilisation.
  - **Guideline 9**- The Atlas should identify the land use planning constraints and threads.

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1 INTRODUCTION

The Atlas of European Ornamental Stones is intended to be a science-based information system which will identify, collect and harmonize existing available data on the provenance of European Ornamental Stones, particularly on what respects the geology, resources, quarrying sites, and competing land uses with emphasis on those that may threaten or sterilize the resource.

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1.1 Scope and purpose

The present document is the deliverable “Summary on the nature and type of available spatial data in each country partner and framework for the Atlas” from WP3 of the EUROLITHOS project - European Ornamental stone resources, which addresses the theme Raw Materials of the GeoEra programme.

The Work package 3 - Atlas of European Ornamental Stones, aims to establish the framework and develop a first edition of an Atlas of European Ornamental Stones, and its integration in the GeoEra Information Platform, which will act as an extension to the European Geological Data Infrastructure (EGDI).

This report summarizes the spatial data available in each partner country regarding ornamental stones, and the main guidelines for the Atlas content. It responds to Task T3.1 - Data inventory, descriptions and requirements for the IP, and to Task T3.2 – Establish the main guidelines for the Atlas content and respective modules. This task will be achieved in two steps. Firstly, a preliminary definition of the spatial data contents regarding the geology of the ornamental stone producing districts, productive geological units, mining sites and quarries, ornamental lithotypes, resources’ availability assessments, land use planning and environmental issues, and other relevant spatial data and topics that should be considered. Secondly, the description and analysis of the available data in each country partner from inputs received in T3.1 (Data Inventory).

This report is structured on the presentation of requirements and guidelines for the Atlas to be addressed and followed by the Information Platform and Eurolithos partners.

2 DATA RELATIONSHIPS AND GENERAL REQUIREMENTS

The EuroLithos project is structured around three main work packages (Figure 1):

- WP3 - Atlas of European Ornamental Stones, which addresses the geographic and geological distribution of the sites where the stones come from;
- WP4 - Directory of Ornamental Stone Properties, which intends to develop an European database for ornamental stones regarding their composition, physical properties and “performance in use” criteria;
- WP5 - Ornamental Stone Heritage, aimed at establishing tools for the process of valorisation of ornamental stones taking into account their heritage value

The starting point for this framework is the name of *each unique type of stone*, differing from other databases of mineral resources where the *geographical location* of occurrences (mineral deposits, mining operations, etc.) is key. **In this way, the unique name of each stone is the link between the WPs, and also the unique ID connecting the geological bedrock with quarries/deposits and the use of stones in construction. WP3 deals with the geographical occurrence and distribution of stone types (i.e., provenance).**

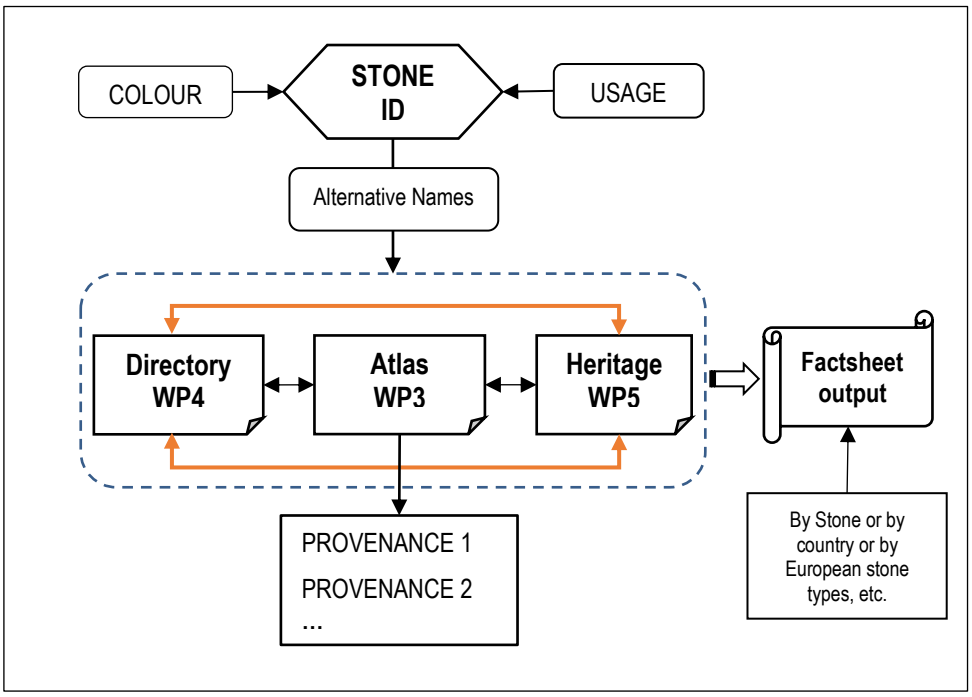

Figure 1- The general structure of the project and relationship between the three main work packages.

Taking into account the knowledge and experience of the EuroLithos partners, this framework also considers alternative names for each stone and acknowledges the importance of their colour and notable uses.

2.1 Unique Object Identifier: the trading name of each stone

Rock types, defined by standardized code lists (i.e., IUGS) based on mineralogical composition, are the main way of scientific characterization of lithological objects. However, the production and trading of ornamental stone instead relates to trade names, defined within wide groups of rock commodities such as hard, siliceous rocks (”granite”) and softer calcareaous or serpentine rocks that can take a polish (”marble”).

One reason for this is the fact that the physical, aestethical and chemical performance of one particular lithology (i.e. ”oolithic limestone”) may show significant variations. Thus, ”oolithic limestone” cannot be expected to be a sufficient sign of quality. Known trade names, however, are. Other reasons include: trade names are in many cases older (and considered to be more thrustful) than geological classification schemes; trade names are the ”common language” in the stone industry, geology is not.

The trade names are linked to a geographical provenance – each name represent a unique quality of stone from a spesific geological unit occurring at a specific place.

Thus, the trade names of ornamental stones is like quality stamps used by prescribers (usually architects) and end-use consumers, and for this reason it should be the starting point for structuring the Eurolithos databases. The European standard EN-12440 Natural stone – Denomination Criteria, describes the denomination of ornamental stones and provides a comprehensive list of European stone names to populate the databases. This list also includes some alternative trading names.

REQUIREMENT

Use the trading name of each ornamental stone as *unique object identifier* in the database.

In some cases, trade names are defined from the place of origin of the ornamental stones, such as Carrara Marble, Estremoz marble and Thasos Marble. There may be subtypes, such as Carrara Statuario and Estremoz Pink. The variability of such subtypes of trade names from one single resource can be significant. Trade names can be very old, even from Antiquity, but also new from last year. A new quarrying company may promote itself by a new trade name beside the historical ones.

It is obvious that the European standard EN-12440 needs regular updates to include new marketed stones or even stones that, for one reason or another, have not yet been

considered. Yet, during the EuroLithos project, priority should be given to stones already included in the standard.

GUIDELINE

Alternative trading names for the ornamental stones should be included in the database.

This dynamic evolution of trade names creates a challenge to Eurolithos; mostly, the geographical (and geological) origin is covered by a main trade name, but a great variability can be seen in subtypes. And, sometimes names are changing through history. I.e., a Greek marble from the island of Evia was known to the Romans as “Marmo Karystium”, but to moderns as “Chippolino Verde”.

Eurolithos will not make efforts for harmonising all the possible varieties of trade names, but leave it to the partner countries to decide on such entries.

GUIDELINE

Give priority to ornamental stones included in EN-12440

2.2 The colour of the stones

The use of stone by Man has been coupled with the evolution of civilizations, from their beginning and ever since. Initially used in the form of utensils, it was later applied as structuring material in the creation of the most varied buildings, from houses and primitive bridges to huge monuments and works of art that currently constitute the heritage of Mankind.

However, since the middle of the 19th century, on account of the nobility of its character, the use of stone as structuring raw material for building purposes has decreased, while its use for ornamental purposes has increased, notably in the cladding of structures to enhance their beauty. In this context, users select the stones primarily because of their aesthetic appearance, in which color is the most relevant property

Indeed, in ornamental stones marketing, color plays a crucial role, which is why many of the trading name of stones is a composite name where the colour is usually mentioned (e.g. Dionyssos White, Giallo Reale, Blue Pearl, Rosa Borba). For this reason and even though colour is one of the properties usually considered in directories of ornamental

stones, it should also be considered in the Atlas database through a direct relationship between the unique name of each stone and its colour, so that end users may have immediate information about it.

REQUIREMENT

The colour of each stone is a main attributes to be considered in the Atlas database.

GUIDELINE

Use simple colour names instead of the fancy names that sometimes are used for the compound name of the stones.

2.3 Remarkable uses of stones

One of the goals of the Eurolithos project is to raise awareness about the European, or even worldwide use of European ornamental stones and the importance they have in our society. For this purpose, examples of the use of each stone in remarkable constructions, whether historical or recent, should be recorded.

Since these constructions can be located spatially, the Atlas should provide a path for identifying their provenance. This can be achieved by Linking unique name with the location of the constructions, their address or a link to another database (e.g. building database from OpenStreetMap). Moreover, each notable construction should have a description and a photographic record.

Construction must be understood here in its broadest sense, be it a modern or ancient building, an artefact, a statue, a drystone wall, a pavement, etc.

REQUIREMENT

Remarkable uses of ornamental stones is one attribute to be considered in the Atlas database.

GUIDELINE

For each use, a brief description and at least one photo should be associated.

3 DATA INVENTORY

As mentioned before, the Atlas of European Ornamental Stones intends to display their provenance, particularly with regard to extraction sites and geology through appropriate geological maps and information on productive geological units.

To this end, a survey was carried out between the EuroLithos partners to find out what type of data are available with regard to the intended Atlas content. Here, the data availability issue means that data is currently available or will be available during the time frame of the Eurolithos project.

After a first question about how many stones to immediately include in the database, the partners were asked to repond on the availability of data regarding the provenance of all the stones in the respective countries, regardless of wheter they are to be immediately included in Eurolithos database or not. Questions about the provenance of stones respected the geographic location and geology.

The questionnaire template used for this survey, as well as the obtained answers are presented in Annexes 1 and 2, respectively. The main conclusions are presented below.

3.1 Selection of stone types

When questioned about their intention to provide data on all stones or on a selection of the most important ones, most of the partners chose to inform that they will begin to provide data for a selection of important stone types in their respective countries. They also pointed out that the inclusion of the remaining stones is a matter of gathering and organizing all stone data and inserting them into EGDI.

Only Greece has shown interest in providing data for all Greek stones during the project time frame.

3.2 Available data on the location of the extraction site of each stone

As will be explained in detail further on, the following possible locations of origin of the stones were considered: quarries, quarrying areas, not yet exploited known deposits, prospects, and quarry provinces.

In all countries except Portugal, it is known the location of the quarries from which come all types of ornamental stones. Most countries also have data on the name or reference number of the quarries and on their activity status. With regard to the location of the quarrying areas, 8 out of 14 partners have the respective polygon geographic coordinates or, at least, are able to provide the coordinates for centroid. Romania does not have this kind of data for all the stones.

With regard to known ornamental stones types gathered in mineral deposits not yet exploited or prospects, only Cyprus, Norway, Romania and Spain may provide the coordinates of the respective areas.

Finally, with regard to quarry provinces, only Cyprus, both partners from Italy, Norway and Romania are able to immediatly provide the polygon respecting all their ornamental stones types. Austria, Croatia and Portugal only can delimit the quarry provinces for some stones.

3.3 Geological maps availability for each ornamental stone

The obtained results on the availability of raster or vector geological maps for the provenance sites of the ornamental stones do not differ too much, therefore, we take only results that respect to vector maps.

Only three countries, Greece, Italy (ISPRA) and Portugal, have detailed geological mapping coverage for some of the provenance sites of their ornamental stones. Regarding country-level regional scales, Italy (SGSS) has all the sites 100% covered at 1/25.000 scale, but not INSPIRE compliant. In Greece and Spain the extraction sites are also 100% covered by geological maps at 1/50.000 scale, which are INSPIRE compliant for the case of Spain.

The more coeherent results refer to small scales: 8 out 13 countries refer a full coverage of sites at scales smaller than 1/250.000, which are INSPIRE compliant in Greece, Norway and Slovenia.

3.4 Data about the geological unit of provenance of each stone

Directly associated with the geological mapping coverage is data availability about the geological unit of provenance of each stone. Almost all countries report that many of these units have a name in accordance with IUGS standards. The exception is Croatia, where this is not the case.

Still regarding the geological units of provenance for each ornamental stone, countries are able to provide their description. It includes information about their chronostratigraphic age and, for some cases, the radiometric age.

3.5 Mineral resources and sterilisation risk for each stone

As for the existence of qualitative data on the size of the mineral deposits of ornamental stone, three partners are able to provide such kind of information for all the stones (Cyprus, Italy-SGSS, and Luxembourg), and four countries are also able to provide it, but not for all the mineral deposits (Norway, Portugal, Romania, and Sweden).

On what concerns the sterilisation risk for these deposits, five of the partners are able to provide qualitative data on it (Cyprus,, Ireland, Italy-SGSS, Luxembourg, and Norway), while two are able to provide only partial information (Romania and Sweden).

4 THE ATLAS FRAMEWORK

From the knowledge and experience of the EuroLithos partners, Figure 2 depicts the Atlas framework with the most relevant items to consider for a spatial database on ornamental stones, their relationships, and the type of information that should be associated with them. It focuses on each unique type of ornamental stone and corresponding places of origin, for which it is intended to provide spatial information on the extraction site and geology

The content of the information associated with spatial data for the Atlas may be more or less detailed, depending on the data availability in each country and the type of end-users. Nevertheless, a minimum information should be provided, and for this some requirements and guidelines are given below. From a close collaboration with WP6, these requirements and guidelines are intended, on the one hand, to inform the GeoERA Information Platform Project (GIP-P) about the needs of Eurolithos and, on the other hand, to inform project partners about the data they will have to provide.

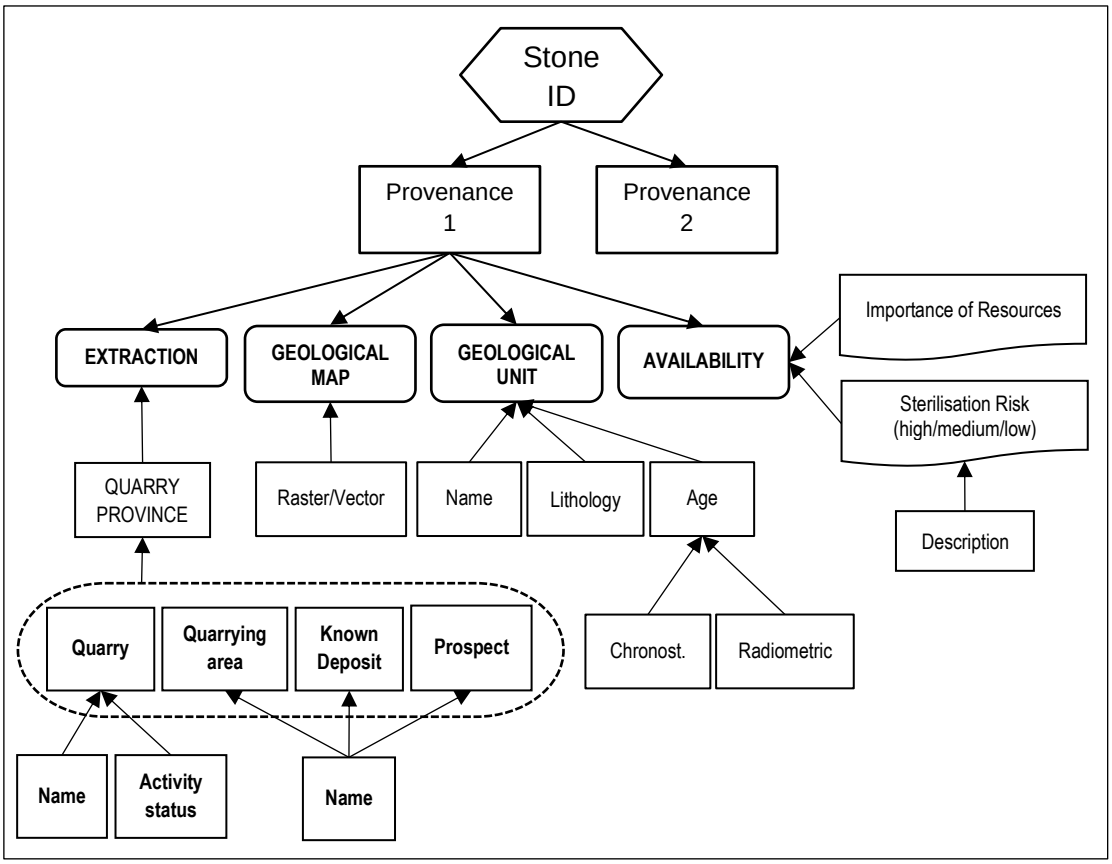

Figure 2- The structure of the Atlas of European Ornamental Stones.

4.1 The provenance of ornamental stones

The main purpose of the Atlas of European Ornamental Stones is to display over a geological map their places provenance.

Having as its starting point the name of each stone, the Atlas is structured according to the provenance of each one of them. However, this is not a straightforward process of geo-referencing each place of provenance. Indeed, each stone may be obtained from multiple places, and each of these places can be the origin of more than one kind of stone.

In the Atlas, these provenance sites are to be described with regard to the extraction place, geology and availability of resources, with the first two associated to the respective spatial data.

REQUIREMENT

Each provenance site relates to two types of spatial data: the extraction site itself and the geology.

The ornamental stone extraction site is generally regarded as an open-pit quarry. However, it must be taken into account that it may also correspond to an underground extraction operation, as is the case with many operations in the mining district of Carrara, Italy.

Obviously, each quarry corresponds to a point for which are indicated the respective geographical coordinates. However, the Atlas must be prepared to accommodate data from multiple databases, which may have provenance sites represented differently. Thus, for this purpose, the following types of representation are also considered: quarrying area, known deposit and prospect (Figure 3.). In addition, each one of them may integrate a broader provenance location: the quarry province.

Desirably, the extraction sites will be illustrated by representative photos.

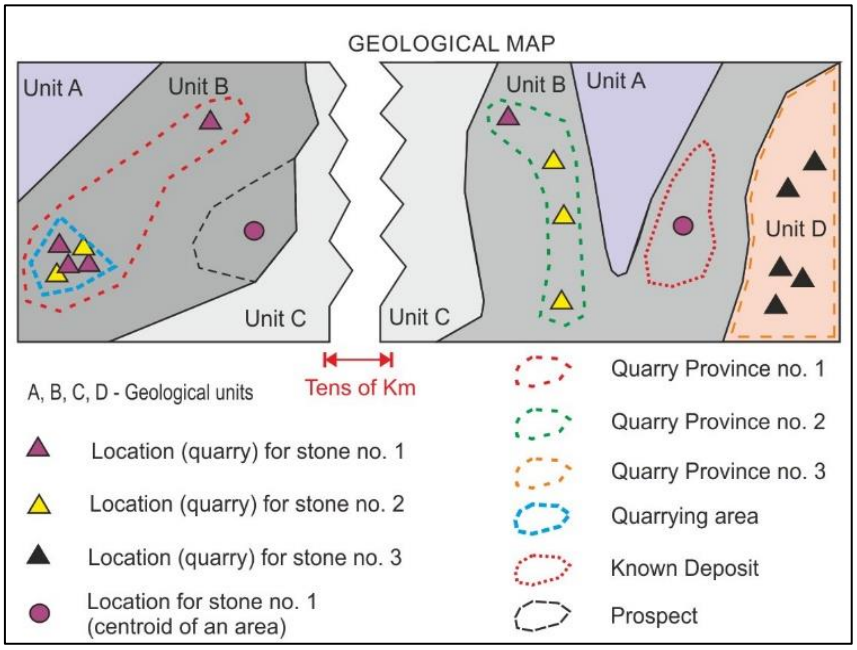

Figure 3- Possibilities for the geographical representation of provenance of ornamental stones, with combination of point and polygon registration.

REQUIREMENT

The Atlas should allow for various types of spatial representation of the sites of origin of the stones: quarries, quarrying areas, known deposits, prospects, and quarry provinces.

GUIDELINE

For quarries, the type of mining operation should be indicated (open pit or underground).

Preferably, quarrying areas, quarry provinces, known deposits, and prospects should be represented by a polygon. However, taking into account the data inventory results, these places are not well spatially-delimited in all countries. That is the reason why they may also be represented by centroids (Figure 3).

GUIDELINE

When needed, spatial data concerning areas may be represented by centroids.

GUIDELINE

- Quarry: a single open-pit or underground place from where the stones are extracted.
- Quarrying area: an area delimiting quarries very close to each other in the same geological unit.
- Quarry province: an area with similar geological properties (may correspond to the total outcropping area of a geological unit), producing similar stone types. The geology is the support for its definition.
- Known deposit: a geologically well-documented deposit in terms of geometry and available resources but not yet being exploited (at least for the considered type of stone). If no economic feasibility study exists, the area to be considered is the outcrop area plus the reasonable projection of their underground limits to the surface (**Feil! Fant ikke referansekilden.**).
- Prospect (= potential area): an area where it is known that a specific ornamental stone occurs but there is no information on the feasibility of mining it.

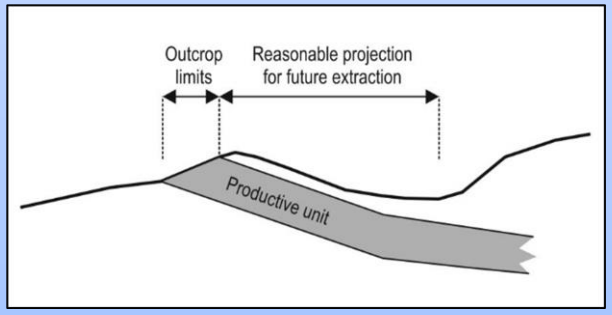

Figure 4- Schematic representation of the surface projection for the reasonable exploitation extent of a geological unit

As mentioned before, the Atlas should give priority to ornamental stones having standard trade names. This means that places from where stones are extracted with non-standard names will not be considered. However, there are extraction sites where the stones are traded with non-standard names, even though they are identical to others extracted in

different sites and whose name is listed in the standard. These are common situations, particularly when the rocks come from large igneous plutonic or sedimentary units, in which slight texture or chromatic variations are used by the producers to promote their rocks commercially. This is one of the reasons why EN-12440 also includes alternative names for the stones.

These extraction sites are also to be included in the Atlas and to them should be assigned the ornamental stone having the standard name unless the name includes a very distinct geographical reference.

GUIDELINE

Include provenance places from which stones come with non-standard names, as long as these stones are identical to others listed in EN-12440.

It is important for users to obtain information about the activity status of the stone provenance sites, particularly, whether or not these sites refer to active operations. It is relevant information because it allows for various inferences, in particular about the availability of resources and the ease of obtaining them. On the other hand, it allows to register the provenance sites of heritage stones that are no longer being exploited.

REQUIREMENT

The activity status of the provenance sites is an attribute to be considered in the Atlas database.

4.2 The Geology of Ornamental Stones

Mineral raw materials are obviously associated with the particular geological conditions that led to the formation of mineral deposits, although, for a large part of these raw materials, it is not possible to establish a direct relationship with the geological unit from which they are extracted. For example, an iron ore may be obtained from several geological contexts and several mineral deposit types. In the case of ornamental stones, it is precisely the opposite because there is a direct relationship with a specific geological unit (a rock type) that, during processing, is not subject to modifications of its internal structure.

This is one of the main distinguishing criteria of ornamental stones in relation to the other mineral raw materials used as construction materials, enabling their qualification as a natural product ..

From this it is easy to conclude the importance of associating each extraction site with a geological map and, more important, with the productive geological unit from where the stones come from, so that the provenance of each stone will be known geographically and geologically.

The geological map and respective geological units can be gathered from the maps already available from other sources (e.g. OneGeology Europe), but it would be desirable to have geological maps at bigger scales, allowing a more accurate identification of the geological units from which the stones are extracted (e.g. national databases).

As it was shown previously, there is a large discrepancy among the country partners in what regards the geologic mapping coverage of the extraction sites at scales bigger than 1:1000.000. Therefore, the geological detail to be provided by the Atlas will vary from country to country.

GUIDELINE

It is desirable for the Atlas to show the geology of the extraction sites according to the map scales available in each country. The productive geological unit should be highlighted.

In any case, it remains to be decided whether these geological maps should be made available within the scope of the project.

With respect to the geological unit of provenance of each stone, it corresponds to an identifiable polygon to which must be associated information related to its formal name, description and age (*cf.* Figure 2).

If within the scope of Eurolithos it is not possible to incorporate detailed geological maps concerning the places of provenance of the ornamental stones, then the Atlas must at least display the quarry province and the respective geological information. Depending on the detail of data to be provided by each country, in some cases there may be a direct correspondence between the productive geological unit and the quarry province (*cf.* Figure 3).

Still regarding the Quarry Province, but as well as the Known Deposits and Prospects, which were already mentioned, they have two-fold meanings:

- Quarry provinces respect to areas where extraction was or is taking place, but also relate directly to the geological unit from where the stones come. As

aforementioned, that correspondence may be totally fulfilled if both have the same extents.

- Known deposits and Prospects refer to places where known types of ornamental stones exist, but, for different reasons, are not yet being exploited. However, they also correspond, totally or partially, to the geological unit of provenance.

REQUIREMENT

The Atlas should display polygons or, less desirable, centroids, representing quarry provinces, known deposits and prospects with the associated geological information (lithology and age).

4.3 The availability of ornamental stone resources

The availability of ornamental stone resources to meet the needs of European society from domestic sources depends on the amount of existing resources and land use planning constraints and threats. The Atlas of European Ornamental Stones intends to provide information about the available resources for each stone, as well as about the sterilization risk for these resources.

REQUIREMENT

The Atlas should provide qualitative information on the availability of resources according to two distinct aspects: importance of the deposit and risk of sterilisation.

The amount of existing resources relates to the importance of the mineral deposit, that is, with its size. The information to be provided should be qualitative, using terms like large deposit, medium-size deposit, etc.

The sterilization risk relates to the lack of accessibility to ornamental stone deposits in land use planning. It is the loss of the option to exploit ornamental stone deposits because the places where they occur are unnecessarily assigned to other uses or activities that are incompatible with mining (e.g. spread of urban areas near mineral deposits, the construction of large infrastructures) or, due to a lack of awareness about the importance of mineral resources, are considered incompatible (e.g. nature conservation areas, reindeer herding areas).

The data to be provided on the sterilization risk should be qualitative (high, medium or low risk). Descriptive information identifying the constraints and threads should also be provided.

GUIDELINE

The Atlas should identify the land use planning constraints and threads.

The identification of land use planning constraints and threads may also be relevant with respect to the preservation of historic quarries, even if the existing amount of resources no longer justifies their extraction.

5 OUTPUTTING INFORMATION

In order to meet end users' needs, the information collected by the project must be provided in a comprehensive way. For this purpose, strong connections must be established in the Information Platform between data collected in WP3 (Atlas), WP4 (Directory) and WP5 (Heritage).

Querying a stone name in the Atlas should provide direct access to, at least, the following type of information:

- Colour;
- Remarkable uses;
- Trading type of ornamental stone (eg. granite, marble)
- Lithological classification (eg. nepheline syenite)
- Identification of the extraction sites and, for the case of quarries, their activity status;
- Identification and description of the geological unit / quarry province of provenance;
- Resources availability and sterilisation risk;
- Links to WP4 and WP5 data

Users should be able to output stone factsheets, each one with the aforementioned Atlas's minimum information and selected data from WP4 and WP5.

For displaying purposes, an user-friendly output should be provided. While respecting a slightly different type of data, an appealing example is given by the Mining Registry Book from the Geological Survey of Slovenia at https://ms.geo-zs.si/en-GB. Figure 5 depicts the main interface, while Figure 6 shows the type of display obtained when selecting an element on the map.

Another example, now regarding buildings and the respective ornamental stones and quarries, is the Building Stones Database (http://www.buildingstones.org.uk/the-building-stones-database/) from the Herefordshire & Worcestershire Earth Heritage Trust (http://www.earthheritagetrust.org/pub/) (Figure 7 and Figure 8). Yet, a similar example of user-friendly display of data is the Bulding Stone Database for Scotland (http://webservices.bgs.ac.uk/buildingstone/map) (Figure 9), hosted by the British Geological Survey, which gives information on quarries and quarrying areas (Figure 10), buildings (Figure 11), and quarry provinces (Figure 12).

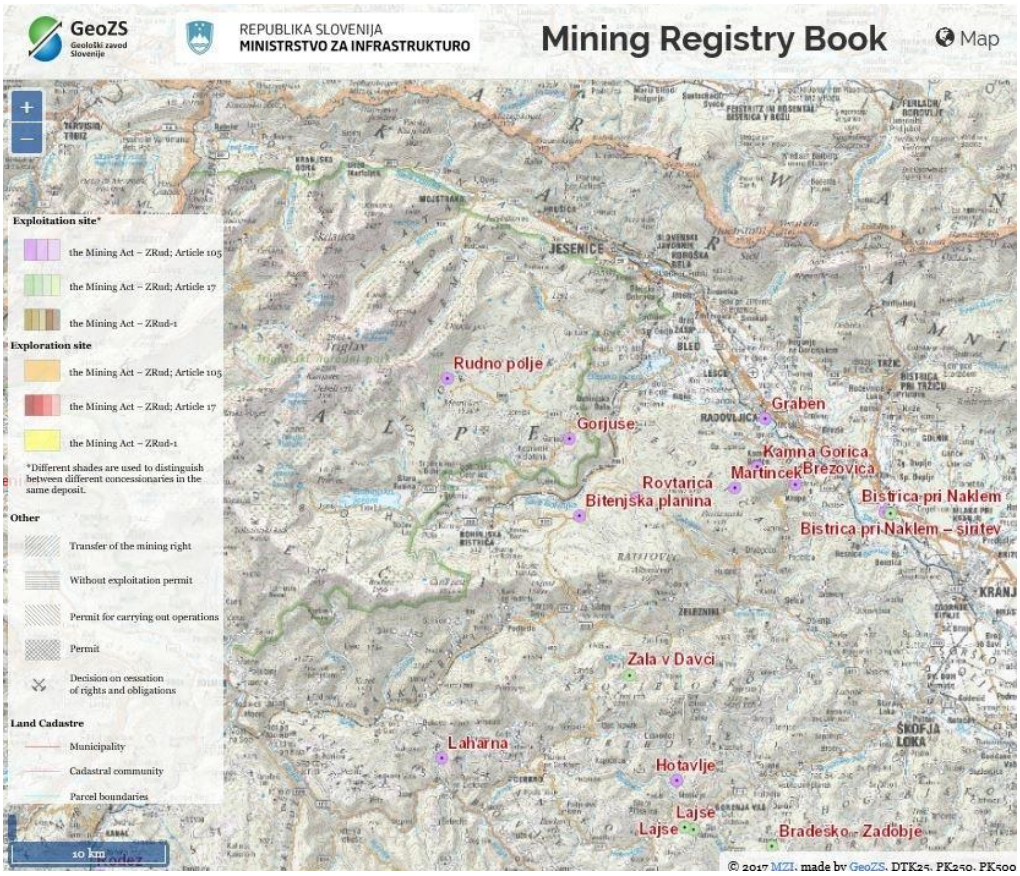

Figure 5- Online Mining Registry Book from the Geological Survey of Slovenia.

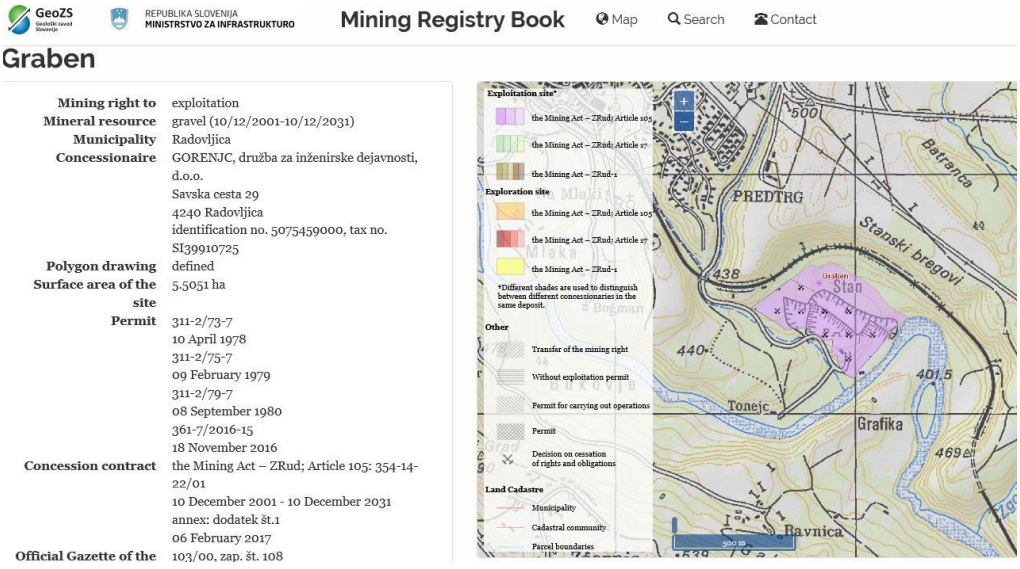

Figure 6- The information output display when selecting an item in the Mining Registry Book from the Geological Survey of Slovenia.

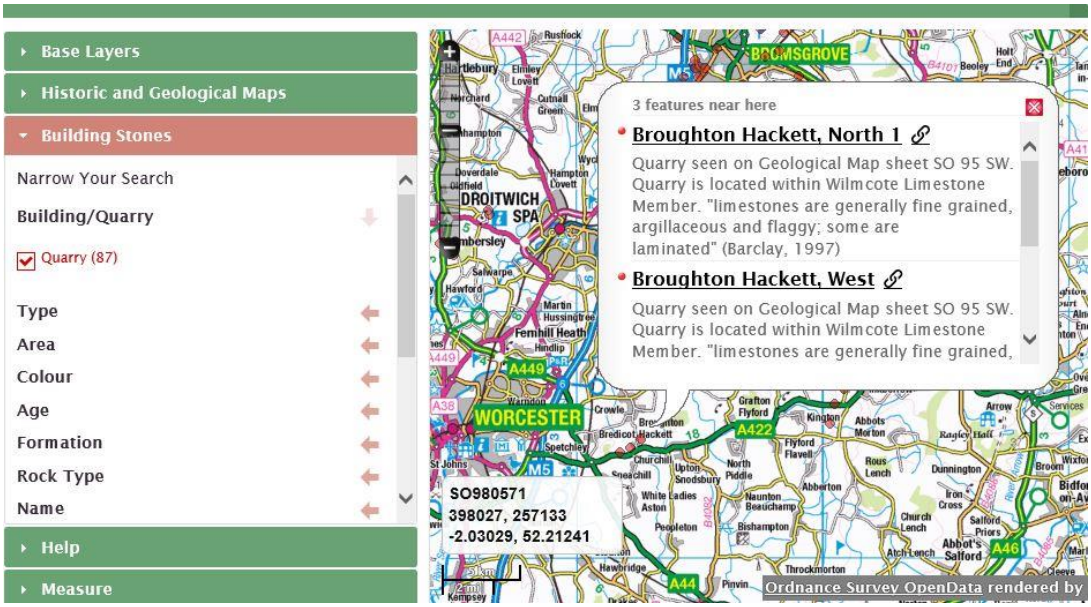

Figure 7- The Building Stones Database interface and display of summary data about the selected item.

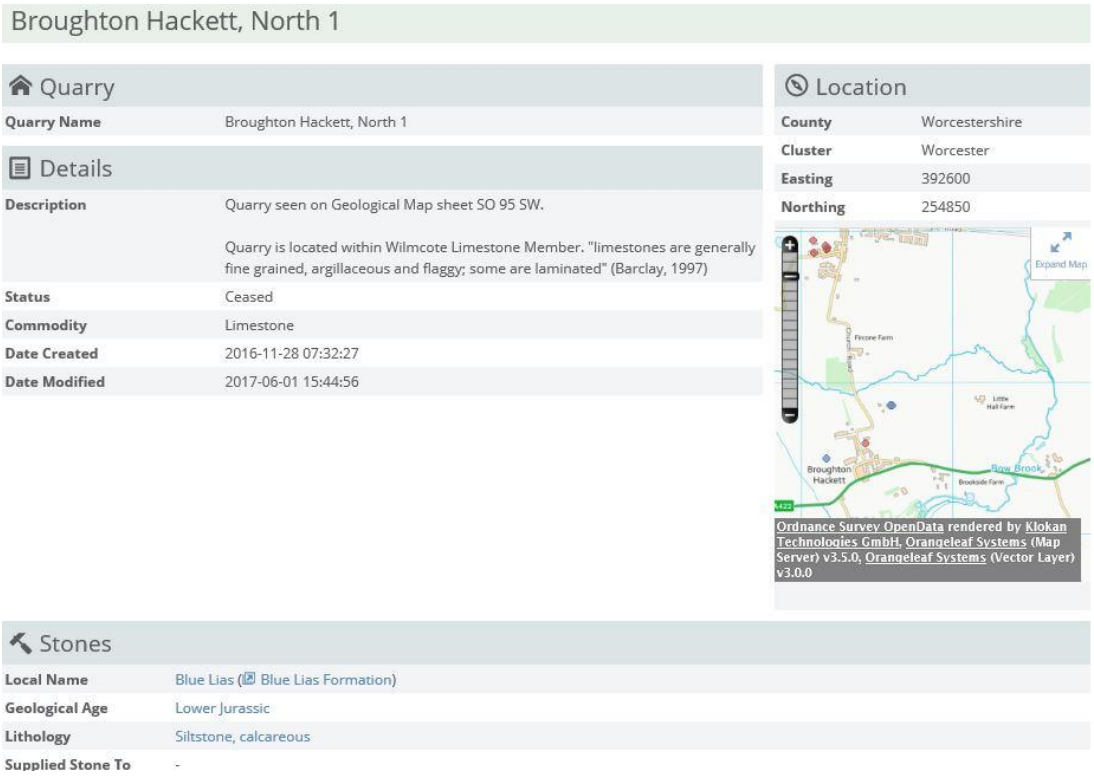

Figure 8- The display of expanded information from the Building Stones Database.

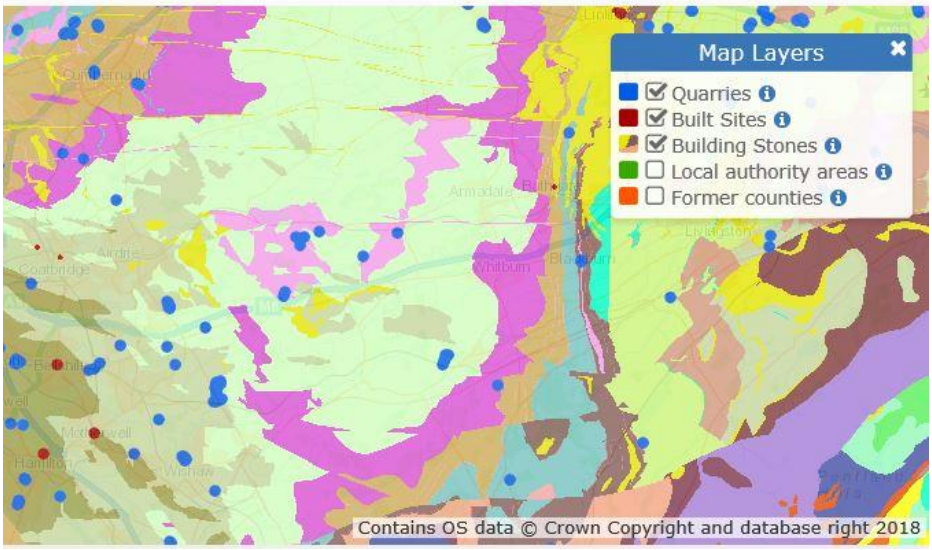

Figure 9- Main interface of the Building Tone Database from Scotland showing the possibility to select the geological unit of the stone's provenance.

Figure 10- Main interface of the Building Stone Database from Scotland showing quarries and quarrying areas.

Figure 11- Display of selected built site from the Scottish database.

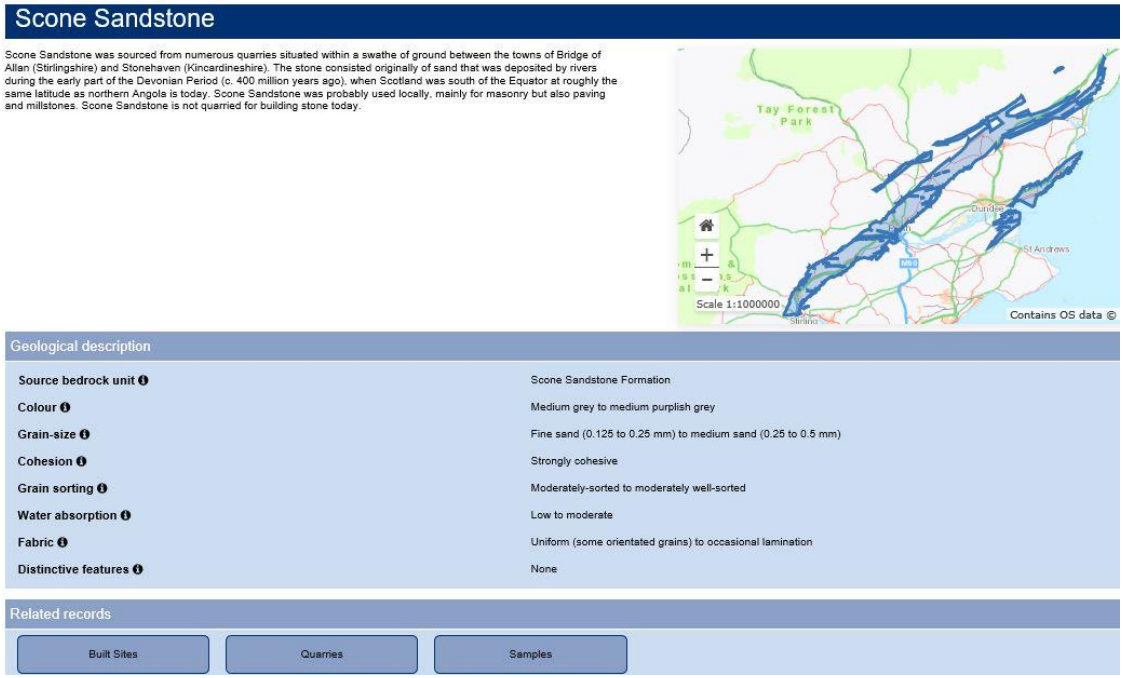

Figure 12- Display of selected quarry province from the Scottish database

6 ANNEX 1 – QUESTIONNAIRE ON AVAILABLE DATA

WP3 QUESTIONNAIRE ON AVAILABLE DATA

SELECTION OF STONE RESOURCES

We will contribute with:	Yes/No
All known stone types in the country	
A national selection of important types	
Examples from case studies/areas	

Remember: during the duration of the Eurolithos project, you may not include all ornamental stones from your country. However, your answers to the following questions should take into account all the ornamental stones.

COMMENTS:

WHAT KIND OF DATA DO YOU HAVE ABOUT THE LOCATION OF THE EXTRACTION SITE OF EACH STONE? (several multiple answers allowed)

Type	Yes/No	Point Coordinates (Yes/No)	Polygon coordinates (Yes/No)	Centroid coordinates (Yes/No)	Name or Number (Yes/No)	Currently active (Yes/No)
Quarry						
Quarrying area						
Known Deposit						----------
Prospect						----------
Quarry Province						

COMMENTS:

GEOLOGICAL MAP AVAILABILITY

TYPE	1/5000 or bigger	1/10000	1/25000	1/50000	1/100000	1/250000 or smaller
RASTER						
VECTOR						
Inspire compliant (Yes/No)						

OBS1.: Because a vector map can be plotted at several scales, it should be considered its original scale.

OBS2.: Here you may answer Yes/No, but it would be better answer in percentages. E.g. 25% quarries covered by 1/25000 vector maps, 45% covered by 1/50000 raster maps, 100% by 1/100000 vector, etc.

- Other specific scales? Which?

- If you only have raster maps, do you have the possibility to vectorise them?

- If maps are not inspire compliant, do you have the possibility to turn them compliant?

COMMENTS:

DATA ABOUT THE GEOLOGICAL UNIT FROM WHICH THE STONE COME FROM

TYPE	Yes/No
FORMAL NAME*	
INFORMAL NAME	
DESCRIPTION	
CHRONOSTRATIGRAPHIC AGE	
ABSOLUT RADIOMETRIC AGE	
REPRESENTED IN THE GEOLOGICAL MAP	

*Name according to IUGS rules

COMMENTS:

DATA ABOUT THE AVAILABILITY OF STONE RESOURCES

	Yes/No
Information about the volume of existing resources	
Information about the sterilization risk*	

*Descriptive information, not necessarily spatial data. Sterilization of a mineral deposit is the loss of the option to exploit it because the territory where it occurs is unnecessarily designated to other uses or activities in land use planning. E.g. spread of urban areas near mineral deposits, the construction of large infrastructures, quarries inhibited from expanding because they are in nature conservation areas or reindeer herding areas, etc.)

COMMENTS:

7 ANNEX 2- RESULTS FROM QUESTIONNAIRE ON AVAILABLE DATA

Selection of stone types

Country	Partner	All known stone types in the country	A national selection of important types	Examples from case studies/areas
Austria	**GBA**		X 1)	
Croatia	**HGI-CGS**		X	X
Cyprus	**GSD**		X 1)	
Greece	**HSGME**	X		
Ireland	**GSI**		X	
Italy	**ISPRA**		X	X
	SGSS		X	
Luxemb.	**SGL**		X	
Norway	**NGU**		X 1)	
Portugal	**LNEG**		X	
Romania	**IGR**		X 1)	
Slovenia	**GeoZS**		X 1)	
Spain	**IGME**		X	X
Sweden	**SGU**	X 2)		

Comments:
1) Initially a selection of stones, then it is a matter of gathering and organizing all stone data and inserting them into EGDI; 2) Depends somewhat on the availability of data.

Availability of data about the quarry of provenance of each stone.

Country	Partner	**QUARRY**				
		Yes/No	Point Coordinates	Polygon coordinates	Name or Number	Currently active
Austria	**GBA**	Y	Y	N	Y	Y
Croatia	**HGI-CGS**	Y	Y	Y	Y	Y
Cyprus	**GSD**	Y	Y	Y	Y	Y
Greece	**HSGME**	Y	Y	N	---	Y
Ireland	**GSI**	Y	Y	N	Y	Y
Italy	**ISPRA**	Y	Y	N	N	Y
	SGSS	Y	Y	Y	Y	Y
Luxemb.	**SGL**	Y	Y	Y	Y	Y
Norway	**NGU**	Y	Y	---	Y	Y 2)
Portugal	**LNEG**	N 3)	Y	Y 3)	Y	Y
Romania	**IGR**	Y	Y	---	Y	Y
Slovenia	**GeoZS**	Y	Y	Y	Y	Y
Spain	**IGME**	Y	Y	N	N	Y
Sweden	**SGU**	Y	Y	Y	Y	Y

Comments: 1) Partially; 2) Data exists but need to know if it can be used; 3) Only for some.

Availability of data about the quarrying area of provenance of each stone.

Country	Partner	QUARRYING AREA				
		Yes/No	Polygon coordinates	Centroid coordinates	Name or Number	Currently active
Austria	**GBA**	N	---	---	---	---
Croatia	**HGI-CGS**	Y	Y	Y	Y	Y
Cyprus	**GSD**	Y	Y	Y	Y	Y
Greece	**HSGME**	Y	N	Y	---	Y
Ireland	**GSI**	---	---	---	---	---
Italy	**ISPRA**	N	N	N	N	N
	SGSS	Y	---	Y	Y	Y
Luxemb.	**SGL**	Y	Y	Y	Y	Y
Norway	**NGU**	N	---	---	---	---
Portugal	**LNEG**	Y	Y	Y	Y	Y
Romania	**IGR**	Y 1)	Y	Y	Y	Y
Slovenia	**GeoZS**	Y	Y	Y	Y	Y
Spain	**IGME**	Y	Y	Y	N	Y
Sweden	**SGU**	N	---	---	---	---

Comments: 1) Partially; 2) Data exists but need to know if it can be used; 3) Only for some.

Availability of data about the deposits not yet exploited and prospects from which the stones come from.

Country	Partner	KNOWN DEPOSIT				PROSPECT			
		Yes/No	Polygon coordinates	Centroid coordinates	Name or Number	Yes/No	Polygon coordinates	Centroid coordinates	Name or Number
Austria	**GBA**	N	---	---	---	N	---	---	---
Croatia	**HGI-CGS**	N	N	N	N	N	N	N	N
Cyprus	**GSD**	Y	Y	Y	N	Y	Y	Y	N
Greece	**HSGME**	N	---	---	---	N	---	---	---
Ireland	**GSI**	---	---	---	---	---	---	---	---
Italy	**ISPRA**	N	N	N	N	N	N	N	N
	SGSS	N	---	---	---	N	---	---	---
Luxemb.	**SGL**	N	---	---	---	N	---	---	---
Norway	**NGU**	Y	Y	Y	Y	Y	Y	Y	Y
Portugal	**LNEG**	N	---	---	---	N	---	---	---
Romania	**IGR**	Y	Y	Y	---	Y 1)	Y	Y	---
Slovenia	**GeoZS**	N	N	N	N	N	N	N	N
Spain	**IGME**	Y 3)	N	N	N	N	N	N	N
Sweden	**SGU**	N	---	---	---	N	---	---	---

Comments: 1) Partially; 2) Data exists but need to know if it can be used; 3) Only for some.

Availability of data about the quarry province of provenance of each stone.

Country	Partner	QUARRY PROVINCE			
		Yes/No	Polygon coordinates	Centroid coordinates	Name or Number
Austria	**GBA**	Y 1)	Y	Y	Y

Country	Partner	QUARRY PROVINCE			
		Yes/No	Polygon coordinates	Centroid coordinates	Name or Number
Croatia	**HGI-CGS**	Y 3)	Y	Y	Y
Cyprus	**GSD**	Y	Y	Y	N
Greece	**HSGME**	N	---	---	---
Ireland	**GSI**	---	---	---	---
Italy	**ISPRA**	Y	---	---	---
	SGSS	Y	---	---	N
Luxemb	**SGL**	N	---	---	---
Norway	**NGU**	Y	Y	Y	Y
Portugal	**LNEG**	Y 1)	Y	Y	Y
Romania	**IGR**	Y	Y	Y	Y
Slovenia	**GeoZS**	---	---	---	---
Spain	**IGME**	N	N	N	N
Sweden	**SGU**	N	---	---	---

Comments: 1) Partially; 2) Data exists but need to know if it can be used; 3) Only for some.

Geological maps availability for each ornamental stone

Country	Partner	RASTER						VECTOR					
		≥ 1/5K	1/10K	1/25K	1/50K	1/100K	≤ 1/250K	≥ 1/5K	1/10K	1/25K	1/50K	1/100K	≤ 1/250K
Austria	**GBA**	---	---	---	---	---	---	---	---	---	80%	Y 1)	100% 1/500K
Croatia	**HGI-CGS**	---	---	---	6,50%	98%	100% 1/300k	---	---	---	6,50%	98%	100% 1/300k
Cyprus	**GSD**	---	7,50%	37,50%	20%	7,50%	2,50%	---	---	37,50%	---	---	100%
Greece	**HSGME**	11 ortophot	---	4 ortophot	---	---	100% 1/500K	39 sheets	---	4 sheets	100%	---	100% 1/1000K
Ireland	**GSI**	---	---	---	---	---	---	---	---	---	---	100%	100%
Italy	**ISPRA**	---	---	---	40%	100%	---	---	---	---	40%	100%	---
	SGSS	---	---	---	---	---	---	---	100% 2)	100%	---	---	N
Luxemb	**SGL**	---	---	70%	30%		---	---	---	70%	30%	---	---
Norway	**NGU**	---	---	---	---	---	---	---	---	---	60%	---	40%
Portugal	**LNEG**	---	---	95%	95%	5%	100% 1/500K, 1/1000K	45%	---	25%	10%	---	100% 1/500K, 1/1000K
Romania	**IGR**	---	---	---	70%	---	100% 1/1000K	---	---	---	20%	---	100% 1/1000K
Slovenia	**GeoZS**	---	---	---	20%	100%	100% 1/1000K	---	---	---	20%	100%	100% 1/1000K
Spain	**IGME**	---	---	---	100%	---	---	---	---	---	100%	---	---
Sweden	**SGU**	---	---	---	100%	100%	100%	---	---	---	50%	45%	5%

Comments: 1) Partially; 2) In mountain areas

Data about INSPIRE compliance and other existing maps

Country	Partner	INSPIRE COMPLIANT						Other scales?	Possibility to vectorise maps?	Possibility to INSPIRE compliance?
		≥ 1/5K	1/10K	1/25K	1/50K	1/100K	≤ 1/250K			
Austria	**GBA**	---	---	---	N	N	N	60% 1/200K	---	N

Country	Partner	INSPIRE COMPLIANT						Other scales?	Possibility to vectorise maps?	Possibility to INSPIRE compliance?
		≥ 1/5K	1/10K	1/25K	1/50K	1/100K	≤ 1/250K			
Croatia	**HGI-CGS**	---	---	---	N	N	N	---	---	N
Cyprus	**GSD**	---	N	N	N	N	N	25% 1/31680	N	N
Greece	**HSGME**	N	---	---	N	---	Y (1/1000K)	---	Y	N
Ireland	**GSI**	---	---	---	---	N	N	---	---	Y
Italy	**ISPRA**	---	---	---	N	N	---	---	---	N
	SGSS	N	N	N	N	N	N	---	---	N
Luxemb	**SGL**	---	---	---	---	---	---	---	---	---
Norway	**NGU**	---	---	---	Y 1)	---	Y	---	---	---
Portugal	**LNEG**	N	N	N	5%	N	N	20% 1/200k raster	N	N
Romania	**IGR**	---	---	---	N	---	N	100% 1/200K vector	N	Y
Slovenia	**GeoZS**	---	---	---	---	---	100% 1/1000K	---	Y	Y
Spain	**IGME**	---	---	---	100%	---	---	100% 1/200K, 1/1000K raster	N	N
Sweden	**SGU**	---	---	---	---	---	5%	---	---	---

Data on the geological unit of provenance for each stone

Country	Partner	Formal name	Informal name	Description	Chronost. Age	Radiometric age	Represented on geological map
Austria	**GBA**	Y 1)	Y	Y 1)	Y 1)	N 2)	Y
Croatia	**HGI-CGS**	N	Y	Y	Y	N	Y
Cyprus	**GSD**	Y	Y	Y	Y	N	Y
Greece	**HSGME**	---	---	---	---	---	Y
Ireland	**GSI**	Y	Y	Y	Y	Y	Y
Italy	**ISPRA**	Y	Y	Y	Y	N	Y
	SGSS	Y	---	Y	Y	N	Y
Luxemb	**SGL**	Y 1)	Y	Y	Y	N 2)	Y
Norway	**NGU**	Y	Y	Y	Y 1)	Y 1)	Y 1)
Portugal	**LNEG**	Y 1)	Y	Y	Y	Y 2)	Y
Romania	**IGR**	Y	Y	Y	Y	Y 1)	Y
Slovenia	**GeoZS**	Y 1)	Y	Y	Y	Y 2)	Y
Spain	**IGME**	Y	Y	Y	Y	N	Y 1)
Sweden	**SGU**	Y 1)	Y 1)	Y 1)	Y 1)	Y 1)	Y 1)

Comments: 1) Partially; 2) Only a few

Availability of data on volume of existing resources and sterilization risk

Country	Partner	Volume of existing resources	Sterilization risk
Austria	**GBA**	N	N
Croatia	**HGI-CGS**	N	N
Cyprus	**GSD**	Y	Y
Greece	**HSGME**	---	---
Ireland	**GSI**	N	Y
Italy	**ISPRA**	N	N
	SGSS	Y 1)	Y
Luxemb	**SGL**	Y	Y

Country	Partner	Volume of existing resources	Sterilization risk
Norway	**NGU**	Y 1)	Y 2)
Portugal	**LNEG**	Y 1)	Y
Romania	**IGR**	Y 1)	Y 1)
Slovenia	**GeoZS**	N	N
Spain	**IGME**	N	N
Sweden	**SGU**	Y 1)	Y 1)

Comments: 1) Partially; 2) By combining data from other agencies