



KINDRA DELIVERABLE D2.3

COUNTRY REPORTS

Summary:

Hydrogeological research and knowledge in Europe have been collected in the European Inventory of Groundwater Research with open access for researchers and the public. The Inventory has been populated by the experts from the EFG's national member associations (Linked Third Parties). They put together the scattered information from diverse sources, consulting at national level the relevant reports and databases of universities, research centres, government bodies, regional and local administrative offices and other parties involved in hydrogeology research. The experts used the terminology and the guidelines created in WP1 and the stakeholder network mobilised by the national workshops in Task 2.2. This deliverable contains an overview of the more "qualitative" information concerning practical and scientific knowledge in the particular country providing more detailed information on sources, as well as barriers and gaps in finding and collecting data for the Inventory.

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1. INTRODUCTION

One of the main objectives of the KINDRA project is the Europe-wide assessment and data collection of existing groundwater-related practical and scientific knowledge focusing on international (in EU dimensions), national and regional activities in a format suitable for further use even after the objectives of the project will be achieved.

Hydrogeology-related knowledge has been reported in an online Inventory with open access for researchers and the public. This work has been implemented by the European Federation of Geologists Linked Third Parties (19 National Associations) participating in the project. They put together the scattered hydrogeology-related information from diverse sources, consulting at national level the relevant reports and databases of universities, research centres, government bodies, territorial administrative offices and other parties involved in hydrogeology research, using the terminology and the guidelines created in WP 1 and the stakeholder network mobilised by the national workshops in Task 2.2.

The recent deliverable contains the overview of the more "qualitative" information concerning practical and scientific knowledge in the particular country providing more detailed information on source, as well as barriers and gaps in finding and collecting data for the Inventory. The data for UK and Ireland, as explained further in the text, have been provided in the updated version of this deliverable.

2. TEMPLATE FOR THE COUNTRY REPORTS

The European Federation of Geologists (EFG) members, National Associations representing 21 European countries (EFG Linked Third Parties, LTPs), were asked to provide the “Country report” related to their work on the European Inventory of Groundwater Research (Inventory further in the text) over the last months. For this action, EFG provided the data collection template with the aim of obtaining "qualitative" information related to practical and scientific hydrogeology-related knowledge on European level. The template consists of the following sections:

1. **Introduction** - the LTPs were asked to provide a short overview on the data uploaded to the Inventory, along with the time consumed for this action.
2. **Source of information** - the LTPs were asked to provide the main source of information used during the data collection with special focus on:
 - 2.1. Institutions dealing with groundwater research/survey
 - 2.2. Groundwater monitoring, availability of data
 - 2.3. Journals/archives focused on hydrogeology
3. **Type of information** - the LTPs were asked to explain based on what they grouped the information into the formerly identified research and knowledge classes (Figure 1).

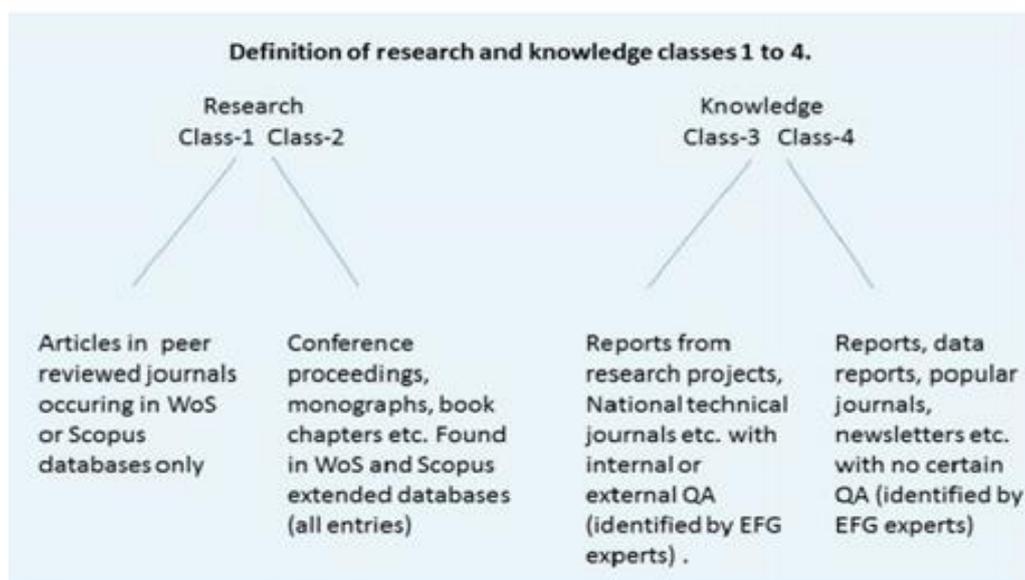


Figure 1. Research and knowledge classes identified in the KINDRA project.

4. **Topics** - the LTPs were asked to indicate how many entries in the Inventory they made for each of the following categories:

- 4.1. National databases
- 4.2. National and local reports containing facts and data
- 4.3. Hydrogeological maps
- 4.4. Technical reports, guidelines, manuals, etc.
- 4.5. Books and book chapters
- 4.6. Position papers and/or important papers on PR journals
- 4.7. Others

5. **Barriers to find data** - the LTPs were asked to indicate the barriers for finding certain types of data, for example: confidential, copyright issues, language, etc.

6. **Gaps in finding the information** - at the end of the report the LTPs were asked to provide their opinion on gaps in finding the information and suggestions how to fill these gaps.

3. GENERAL OVERVIEW OF THE COUNTRY REPORTS

In the introduction section the EFG LTPs pointed out the importance of the Inventory as a useful tool for collecting the knowledge in hydrogeology. They provided information on the total number of the entries, frequently mentioning that this number is not final and will increase, since the input action for some of the LTPs is still ongoing.

Although the Inventory interface has been recently improved and became even more user friendly, some of the experts still find it difficult to work with. Due to that reason, the time required for the entries comparing with the total number of entries varies a lot from expert to expert (15-45 minutes). It is also very important to mention that the phase of gathering the data (e.g. literature studies, visits to various institutes and companies dealing with hydrogeology) took most of the experts' working hours, especially for the publications on national languages which needed the translation of the relevant parts to English (e.g. abstract). Despite all difficulties they were facing, most of the LTPs have reached or are on the right way to fulfil the expected 50-100 entries by country. These numbers were set up by EFG, coordinator of this action. Table 1 summarises the number of the EIGR entries together with the name(s) of the reporters. Additionally and due to the lack of human resources in 2016 since the work involved was greater than they believed it to be when the project was first outlined and because such work is not easily compatible with their usual methods of working, the Ireland, the Switzerland and the UK decided, in agreement with EFG, to execute KINDRA tasks during the 2017. These include both organization of the KINDRA National workshop and Inventory population together with accompanying reports. The new deadline set for NA to reach the number of 50 publication is 17 February 2017.

Table 1. Summary of the Inventory data collection and the total number of entries until the 05 December 2017, along with the names of reporters (the countries are listed in alphabetical order).

Country	Reporter(s)	Total no. of entries
1. Belgium/ Luxembourg	Alain Dassargues Dirk De Coster Nuno da Silva	62
2. Croatia	Kosta Urumovic	44
3. Czech Republic	Petr Novák Michal Vaněček	584
4. Denmark	Lisbeth Flindt Jørgensen	64
5. Finland	Ulpu Väisänen	204
6. France	Marina Alazard	139

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7. Germany	Walter Lenz	68
8. Greece	Triantafyllos Kaklis	56
9. Hungary	Ágnes Kriván Péter Scharek	54
10. Ireland	Moe Henning	39
11. Italy	Del Bon Andrea	118
12. Netherlands	Jan Stafleu	91
13. Poland	Marta Dendys Magdalena Tyszer	50
14. Portugal	Monica Sousa	55
15. Serbia	Vesna Ristic	98
16. Slovenia	Mihael Brenčič	62
17. Spain	Miguel Bordallo	70
18. Ukraine	Alexandar Bobrov	57
19. UK	Nic Bilham	68
		Total: 1986

In order to collect the information relevant for the Inventory, LTPs used different sources on national and regional level. These included:

- a) Institutions supporting and monitoring hydrogeology-related research in general;
- b) Institutions dealing with groundwater research and/or survey; and
- c) Responsible governmental bodies.

The national hydrogeological archives and source databases were also considered, mostly focused on journals, reports and other relevant publications dealing with the “water sector” and, more broadly, with geology. Table 2 summarizes the most important sources of information per country as reported by the LTPs.

Table 2. Summary of the most important sources of information per country.

Country	Source of information
1. Belgium/ Luxembourg	<ul style="list-style-type: none"> • Hydrogeological Database of Wallonia • www.map.geoportail.lu • DOV-Vlaanderen • www.pch.public.lu • Smart Geotherm • www.belgium.iah.org • www.atlas-belgique.be • www.integraalwaterbeleid.be • www.dov.vlaanderen.be • www.eau.public.lu • www.geobru.irisnet.be • www.environnement.public.lu
2. Croatia	<ul style="list-style-type: none"> • Croatian geological survey (HGI-CGS) • Faculty of Mining Geology and Oil engineering (RGNF), University of Zagreb • Croatian waters (Hrvatske vode) d.d. • Groundwater monitoring was conducted by a few experts from GHI-CGS, and also from Croatian waters • Local water management companies

3. Czech Republic	<ul style="list-style-type: none"> • Section of Deputy Prime minister for Science, Research and Innovation • Ministry of the Environment of the Czech Republic • Ministry of the Industry and Trade of the Czech Republic • Czech Environmental Information Agency • Nature Conservation Agency of the Czech Republic • The Czech Science Foundation • TA CR • Czech Geology Survey • T. G. Masaryk Water Research Institute 	<ul style="list-style-type: none"> • Czech Hydrometeorological Institute • Geofond • Geopub • Information Register of R&D result • The Central Register of R&D projects • National Library of Technology • National repository of grey literature
4. Denmark	<ul style="list-style-type: none"> • Geological Survey of Denmark 	
5. Finland	<ul style="list-style-type: none"> • Geological Survey of Finland (GTK) • University of Helsinki, Finland • Finnish Environment Institute (SYKE) • Regional Centres for Economic Development, Transport and the Environment • Radiation and Nuclear Safety Authority • Regional Water Supply Enterprises • Ramboll Finland Oy (Ltd.) 	<ul style="list-style-type: none"> • HAKKU (archives of Geological Survey of Finland) • HELDA (archives of Helsinki University) • OIVA (archives of the Finnish Environment Institute)
6. France	<ul style="list-style-type: none"> • French Geological Survey • www.cordis.europa.eu • Websites of universities and research centres • www.adeseafrance.fr • Science Direct • Springer 	
7. Germany	<ul style="list-style-type: none"> • Springer • www.umweltbundesamt.de • Geological Survey of Germany 	
8. Greece	<ul style="list-style-type: none"> • Institute of Geology and Mineral Exploration • Aristotle University of Thessaloniki • National Documentation Centre • Special Secretariat of Water 	
9. Hungary	<ul style="list-style-type: none"> • Geological and Geophysical Institute of Hungary • Ministry of Environment • Acta Geologica Hungarica • National Archive of the Office of Mining and Geology 	
10. Ireland	<ul style="list-style-type: none"> • Irish Centre for Research in Applied Geosciences • Environmental Protection Agency • Geological Survey of Ireland (Groundwater Section) • Teagasc (the Agriculture and Food Development Authority) • Irish Centre for Research in Applied Geosciences • Environmental Protection Agency • Geological Survey of Ireland (Groundwater Section) • Teagasc (the Agriculture and Food Development Authority) 	
11. Italy	<ul style="list-style-type: none"> • ISPRA (National Institute for Environmental Protection and Research) • ISTAT (National Statistics Institute) • IRSA-CNR (Water Research Institute of the National Research Council) • Regional and Basin Authorities • Italian Journal of Groundwater • Italian Journal of Engineering Geology and Environment 	
12. Netherlands	<ul style="list-style-type: none"> • Geological Survey of the Netherlands (TNO-GSN) • Deltares 	

	<ul style="list-style-type: none"> • Alterra • KWR Watercycle Research • NHI - Netherlands Hydrological Instrument • Utrecht University • VU University Amsterdam • Wageningen University and Research • Dutch Provinces • Dutch Water Boards • <u>DINOloket</u> • https://www.nhv.nu/info-stromingen • http://www.kngmg.nl/njg/ • https://www.h2owaternetwerk.nl
13. Poland	<ul style="list-style-type: none"> • Polish Hydrogeological Survey • Ministry of Environment • Polish Geological Institute • Chief Inspectorate of Environmental Protection • Universities
14. Portugal	<ul style="list-style-type: none"> • Universidade dos Açores • Universidade do Algarve • Universidade de Lisboa • Universidade Lusíada • Universidade NOVA de Lisboa • Universidade da Madeira • Universidade do Porto • Universidade de Trás-os-Montes e Alto Douro • APRH - Associação Portuguesa dos Recursos Hídricos • Centro Hospitalar das Caldas da Rainha • International Journals (ExpressSed, Journal of Hydrology, Chemie der Erde, Engineering Geology, Geofísica Internacional, Journal of Volcanology and Geothermal Research, Agricultural Water Management; Chemosphere, Science of the Total Environment, Estuarine, Coastal and Shelf Science, Geothermics, Journal of Geochemical Exploration, Applied Geochemistry, Sensors and Actuators A: Physical • Project Report (WAT – Water and Territories • Universidade de Aveiro • Universidade de Coimbra • Universidade da Covilhã • Instituto Politécnico de Beja • Instituto Politécnico de Castelo Branco • Instituto Politécnico do Porto • Câmara Municipal do Porto • CCDR-Algarve • DGEG – Direção Geral de Energia e Geologia • Direção Regional do Ambiente - Açores • EMAS Beja • LNEG – Laboratório Nacional de Energia e Geologia • SMAS Ponta Delgada – Serviços Municipais de Água e Saneamento • International Proceedings Journals (Procedia Engineering, Procedia Earth Science and Planetary Science, Materials Today: Proceedings • National Journals (Recursos Hídricos (APRH), GEONOVAS (APG)
15. Slovenia	<ul style="list-style-type: none"> • Slovenian Geological Survey • Ministry of Environment
16. Serbia	<ul style="list-style-type: none"> • National journals (Vodoprivreda, Tehnika, Anali Balkanskog poluostrva) • International journals (Hydrogeology Journal, Environmental and Earth Science, Archives of Mining Sciences) • Papers presented at national and international conferences in the fields of geology and hydrogeology.
17. Spain	<ul style="list-style-type: none"> • Geological Survey of Spain (IGME) • Research Gate platform
18. Ukraine	<ul style="list-style-type: none"> • EA UAG • Institute of Geological Sciences of NAS of Ukraine (Geological journal) • Institute of Geology • Taras Schevchenko National University (Bulletin of Taras Shevchenko National University, Series "Geology")

	<ul style="list-style-type: none"> ● Oles Honchar Dnipropetrovsk National University (Dnipropetrovsk University bulletin. Geology, geography) ● State Geological Survey of Ukraine ● State Scientific-Production Enterprise "State Informational Geological Fund of Ukraine" ● V.N. Karasin Kharkiv National University (V.N. Karasin Kharkiv National University Bulletin, series "Geology, Geography, Ecology") ● M.P.Semenenka Institute of Geochemistry, Mineralogy and Ore Formation of NAS of Ukraine (Geochemistry and Ore Formation Journal) ● Maksymovych Scientific Library ● Vernadsky National Library of Ukraine
19. UK	<ul style="list-style-type: none"> ● British Geological Survey (BGS) ● Environment Agency (EA) ● Universities

In order to classify the data according to the research and knowledge classes (Figure 1), information gathered from universities and research institutes were ranked as Class 1 or Class 2 data. The information gathered from the regional authorities were valued as Class 3 and Class 4 data. The overall entries are mostly related to Class 3 and Class 4. The reason for that, as pointed out by most of the LTPs, was that they were focused on publications and data sources which are not available through the well-known and accessible data bases (e.g. Web of Science or Scopus) and mostly belong to Class 1 and Class 2 in order to avoid copying already publicly available databases. The topics of the data covered the wide range of publications grouped in several relevant domains:

- a) National databases;
- b) National and local reports containing facts and data;
- c) Hydrogeological maps;
- d) Technical reports, guidelines, manuals, etc.;
- e) Books and book chapters;
- f) Position papers and/or important papers on PR journals;
- g) Others.

The number of entries per LTP related to the above mentioned topics are summarized in Table 3. The Ireland and the UK LTPs have provided their reports in 2017 as already has been explained.

Table 3. Summary of the data sources with the numbers of entries reported by the LTPs.

Country	Topic						
	a) Databases	b) Reports	c) Maps	d) Technical reports	e) Books	f) Papers	g) Others
	Number of entries reported on 31 December 2016						
Belgium/ Luxembourg	3	9	4	2	2	7	2
Croatia	-	-	1	1	1	2	-
Czech Republic	12	587	11	10	55	-	98
Denmark	3	8	4	-	-	5	12
Finland	3	78	4	15	10	2	-
France	2	2	2		1	82	8
Germany	-	4	3	-	-	9	-
Greece	1	10	-	-	-	-	3
Hungary	2	8	3	-	-	-	-
Ireland	-	6	-	6	-	27	-
Italy	5	-	3	1	-	87	3
Netherlands	4	20	21	-	-	-	7
Poland	-	16	6	9	17	-	2
Portugal	-	-	-	1	-	48	9
Slovenia	1	3	-	6	10	42	-
Serbia	1	7	-	-	3	87	-
Spain	4	4	1	3	5	28	4
Ukraine	9	12	6	-	-	24	-
UK	2	-	1	2	-	49	5

The barriers for finding and collecting data (e.g. confidential, copyright issues, language, etc.) as well as gaps in finding the information differ from country to country and are presented for each country separately. The countries are listed in alphabetical order:

1. BELGIUM & LUXEMBOURG

Barriers:

- Belgium at national level: Groundwater is a regional matter in Belgium. Data concerning groundwater for Belgium as a whole are outdated;
- Belgium-Wallonia: The main issue is to find data in English, there is a lot of information existing in French. It was said clearly during the EIGR workshop in Sevilla that priority should be given to documents written in English. Due to the limited time for metadata input to EIGR, the expert started with those data records;
- Belgium-Flanders: Reports are mostly in Dutch. Data of consulting companies are generally confidential and therefore, not available to public;

- Belgium-Brussels: Reports are in French and/or Dutch. Data of consulting companies are generally confidential and therefore, not available to public;
- Luxembourg - Reports are in French. Data of consulting companies are generally confidential and therefore, not available to public.

Gaps:

- Belgium-national: Groundwater is a regional matter in Belgium, fractioning the information making data gathering more complex and difficult to have a whole picture.
- Belgium-Wallonia: There is no gap to find the data. But, on the contrary, the system should be available and customized to allow main organizations dealing with hydrogeology data and reports to feed and populate EIGR.
- Belgium-Brussels: Groundwater being a regional matter in Belgium and Brussels being part of Flanders geographical region, but a region politically independent, creates even further difficulties to gather information.
- Luxembourg - Major gaps are identified and further information will be collected by the end 2016.

2. CROATIA

Barriers:

- There are some problems with obtaining data from national water company since there is no publicly available database.
- All the data were obtained through personal connections. Other input data were collected from Croatian scientific database (www.bib.irb.hr)

Gaps:

- It would be good to have a national groundwater data and research database available to public.

3. CZECH REPUBLIK

Barriers:

- The main obstacle for populating EIGR with relevant groundwater related records is the abundancy of data. In the Czech Republic, there are available literally tens of thousands groundwater related outcomes, mostly site specific hydrogeological survey reports or evaluations;

- The main task is not to find the data, but to sort them and select what to incorporate into the EIGR;
- Czech is the dominant language of data and it is questionable whether these might be useful for those who cannot speak Czech.

Gaps:

- Due to the Czech Republic regulatory framework, virtually every groundwater related survey or research report should be submitted to the Czech Geological Survey archive. We believe unless some kind of government backed agreement is adopted, it is unrealistic to enter the complete archive in the EIGR.

4. DENMARK

Barriers:

- No critical barriers have been identified so far.
- All relevant information is available on the internet, but there are constraints on what information can be used due to copyrights.

Gaps:

- Major gaps in finding the information haven't been reported. The main concern is the big amount of information in Denmark and with the limited resources only a part of data (most relevant) can be stored to the inventory.

5. FINLAND

Barriers:

- The barriers are copyright issues, including limitations for commercial purposes;
- Using data for other purposes, e.g. scientific research, teaching or quotation, the original knowledge/text need to be mentioned.

Gaps:

- Gaps are not identified. A lot of data are freely available from public databases. Up to now there were no problems to find data for EIGR.

6. FRANCE

Barriers:

- **Copyright:** The main barrier to find data is the restriction related to copyrights for scientific papers (more than 90% of the publications). Most of the papers are available online in pdf format via the Research Gate network, but the legality of this access is not clear. That is why, so far, the expert did not provide the link toward these pdfs when available;
- **Authenticated access:** Data related to groundwater in France are freely available via the ADES database. However, for national security reasons, the user must register first. The access to the geographical coordinates of the information is possible only after being identified and authorized. For the FATE database as well, the user must be authorized before having access to the data.
- **Language:** As the instruction was to gather information in English as far as possible, a lot of technical reports were not integrated in the EIGR as they are exclusively in French. The ADES database searching tool is also in French.
- **Data format:** One of the main issues when looking for data is that whenever data are available/published in the literature, it is in the form of text, tables in the text or pictures and cannot be readily extracted or used. A very valuable tool would be the possibility for authors to upload their publication as well as their dataset in the form of spreadsheets.

Gaps:

- Finding information on a specific area is complicated as most of the keywords are related to the topics, the tools, the context, the name of the study site etc. but rarely the geographic area. This is why it is very valuable to provide the map tool within the EIGR. It will help finding information and visualize the location.

7. GERMANY

Barriers:

- Data insertion too time consuming.

Gaps:

- No gaps.

8. GREECE

Barriers:

- The main problem in finding data is the copyright and the license needed to upload the data to EIGR;
- Most of the public-sector bodies that are responsible for the execution of a study do not publicise the final study. In this case we can collect only the title and the person of contact who is responsible at each department;
- It was not possible to upload details for each project but only a general synopsis of it at “abstract” section due to the lack of information.

Gaps:

- EIGR is very detailed in presenting all types of data that are collected and can provide many choices in categorising regarding the final result. The main problem is to have access to data in some critical sections of public sector. This sector delivers data each year for studies that were depicted and this can give us some critical details regarding the groundwater research. Therefore personal communication should be made with the companies that have produced these reports in order to obtain the data.

9. HUNGARY

Barriers:

- The hydrogeological data in Hungary are scattered among different institutions on national, regional and local level;
- Only the public archives are open for the research and data collection.

Gaps:

No gaps.

10. ITALY

Barriers:

- Technical reports (such as those related to regional or provincial projects) are not easy to access (specific application must be submitted) and, often, they are available only in hardcopy format;

- The fact that some journals or some documents are not free, therefore data required to complete satisfactorily EIGR entry form cannot be retrieved;
- Evaluation of the relevance of the identified source.

Gaps:

- In several cases, having to request for information to holders or owners of a specific source, sometime may pass before being answered;
- It would be appropriate in the EIGR entry form if a memo field is made available, in which report missing information, corrections or additions to make, or even explain why certain information is not available. This field should only be visible to the user in charge of filling the form and to database managers;
- The ultimate aim would be to identify quickly records to be modified, especially when the number of records added overstep the order of tens or hundreds.

11. IRELAND

Barriers:

- None

Gaps:

- Funding information required that contact be made with prime authors.
- Several entry fields were left blank, as the information requested for some publication types are not relevant to all entries.

12. NETHERLANDS

Barriers:

- Hydrogeology research is spread out between various institutes (Deltares, TNO, KWR), national and regional authorities such as the twelve Provinces and the 22 Water Boards, companies and universities. However, the Netherlands are in a very good position since most of the data and many of the models (borehole descriptions, data from monitoring wells, 3D hydrogeological models) are concentrated in a single national database and publicly available;
- Long waiting times and slow communication with professional contacts;
- The language used in most material is either Dutch or English. The use of Dutch may be, of course, problematic for users from other countries (besides Flanders).

Gaps:

- Selection of the most important papers and reports that are relevant for KINDRA, since the amount of material is enormous;
- An important question is if KINDRA should aim at building a database including scientific research published in peer-reviewed papers and in QA- passed reports, or should focus on the publicly available data and models. Our recommendation is to pursue the latter option, since for instance Scopus has already indexed the former.

13. POLAND

Barriers:

- Population and data entry in accordance with the intellectual property or copyrights of official portals of national branches and institutions associated with groundwater;
- To distinguish the relevance of the documents;
- Unavailability of certain publications;
- The relatively small amount of resources also had data (even the title) in other language than Polish.

Gaps:

- Perhaps, it is worth considering the introduction for branches and institutions in EU Member States obligation to include in their elaborations, reports, guidebooks, informants etc. additional title (and abstract of publication) in a foreign language, best in English. Currently, this type of solution is widely used in publishing companies of scientific journals and certainly supports the flow of information and exchange of experiences between scientists from different countries - not only in Europe, but even in the world. An obligatory indication of the titles also in English, will contribute to the better integration of activities by the EU members and associated countries in the field of groundwater management.

14. PORTUGAL

Barriers:

- The main barrier to find data is the access to international journals, the majority of which have paid access. As the national expert is based at the University of Porto, this was easily overcome.
- All articles are copyrighted.
- In a wider search it was found that many national resources lack some necessary information (e.g. publication date, information related to the authors, abstract, etc).
- Some data are not easily transposed to EIGR (e.g. data from SNIRH - Sistema Nacional de Informação de Recursos Hídricos – National Information System of Water Resources).

Gaps:

- The data selection focused mainly on international journals. The resources have been chosen in order to cover several subjects related to hydrogeology/ groundwater. As it was said previously, in a wider search it was found that many national resources lack some necessary information (e.g. publication date, information related to the authors, abstract, etc).

15. SERBIA

Barriers:

- The major problem was associated with reports prepared in the national language and those that had no abstracts in either the national language or English. The authors of these reports were generally too busy with their day-to-day activities to prepare information on particular reports, and to do so in English. A large number of researchers do not know English well enough to produce information about a report in English and relay such information for entry into the KINDRA inventory. As such, a translator would have to be engaged.
- Another problem is that studies are generally prepared for a client, who is the owner of the study. Consequently, the owner's consent would have to be obtained for entry of information into the inventory. In most cases, the owner is not a hydrogeologist and does not view the KINDRA project as a hydrogeologist would.
- Ultimately, there is the matter of confidentiality – whether the data contained in the reports can be entered into the inventory or not.

In summary, the major problem is lack of time for authors to prepare information about hydrogeological reports, followed by language and confidentiality issues.

Gaps:

- One of the shortfalls of the inventory is that the listing of countries does not include Serbia. We overcame this problem by typing in Serbia. Given that there was no “Serbia” option, it is likely that the information entered by Serbia was integrated with that of other countries, possibly the Czech Republic. Should be checked!
- There were also issues with data input and editing, primarily in the case of abstracts (copy/paste from Word). We will handle these issues by subsequently correcting/formatting the abstracts in the KINDRA inventory.
- A person will have to be hired full-time or part-time to enter hydrogeological research information next year. This person would focus solely on information gathering and input, and needs to be a hydrogeologist with a good knowledge of English.

16. SLOVENIA

Barriers:

- From hydrogeological point of view, Slovenia is well explored, however data in published sources are available in journals, monographs and internet sources. These are representing only a relatively small share of the total existing data and results.
- Large part of hydrogeological data are available in the unpublished reports. An estimated 80% of the total data on the national basis are covered in the unpublished reports, only 20 % of data are available in the public data sources. This is valid especially for hydrogeological investigations performed before the year 2000. After 2000, due to the implementation of the new Water Law which requires that certain information must be available to the public, situation has changed, however large part of the data remains non-accessible. In the recent years, there has been an important improvement in the availability of data collected at state level, monitoring performed by the Environmental Agency of Slovenia. Archive of data for groundwater levels (intergranular aquifers) and spring discharges obtained after the World War Second is available online. Qualitative data on monitoring at the state level, which were performed in the last ten years are also online are available. The Agency is also giving online access to its reports produced in the recent years.

- The Geological Survey of Slovenia is the most important institution producing hydrogeological data. This institution has the biggest hydrogeological archive in the state which is well developed and organised (archive is totally digitised with several thousands of archival units). The archive of Geological Survey of Slovenia does not have the official status of the public archive. The archive includes reports from the past, even some old written documents from the Austrian-Hungarian Monarchy. However, the archive is closed for the public, archival units are freely available only for the members of the Survey. For the public, the archive is difficult to access. In case of interest by an outsider person, the decision on the accessibility is made on the fact whether the requested data or reports were obtained through public funds. According to the valid legislation, results from publicly funded research must be accessible. Very often access is declined due to interpretation that research was not financed by the public funds. Public funds are interpreted strictly and only as research founded through the state programs; research supported from other public sectors is often not interpreted as financed from public funds (e.g. waterworks and public water supply enterprises).
- Similar situation can be found also in other institutions which are archiving hydrogeological data and results. Contrary to the Geological Survey of Slovenia their archives are not well developed and evidence for the reports are weak. Special situation is in the case when hydrogeological reports are produced by private enterprises; usually these reports are not accessible to the public. Reasons for these are that their hydrogeological work is performed for private enterprises which are not allowing access to their data.
- Accessibility and limitations of the hydrogeological data is related also to the publications. In the past, hydrogeological research was published in journals *Geologija*, *Materials and Geoenvironment*, and *Acta Carstologica*, and occasionally, also in several other journals; some of them are no more existing. Results were published also in some of the monographies as independent works (rarely) or as book chapters. There is no review on Slovenian hydrogeological bibliography, the overview on hydrogeological data, results and interpretation is possible only based on the expert's knowledge.

Gaps:

- During the KINDRA national workshop the problem of data accessibility was intensely discussed. General opinion of the expert was that public institutions must be improved the accessibility to data in their repositories. It was also pointed out that the initiative

on the discussion about data availability must be indicated at the state level, and data must be available and accessible to the public, regardless of whether the research was financed on public funding or not.

- In Slovenia, the review and overview of the past and recent hydrogeological research are urgently needed. There is also a need to collect data on hydrogeological bibliography. Construction of the proper hydrogeological data base is possible only based on these activities.
- The expert suggests KINDRA to initiate discussion on the public availability of hydrogeological data and results at an EU level. It will help a lot if the access to hydrogeological knowledge will be promoted through the legislation defined at an EU level.
- Present approach of KINDRA for entering of data into the data base is based on the expert's knowledge involved in the project. It is advisable to initiate activities on national hydrogeological bibliographies and systematic studies on the hydrogeological publications as well as data sources.
- During the KINDRA national workshop there was also an extensive discussion on hydrogeological terminology and the problems related to these were identified as twofold. First is hydrogeological terminology in national language. The second one is international hydrogeological terminology where certain terms/words are not equivocally defined causing problems in interpretation of legislation and in the communication between different professions. The expert strongly suggests initiating this discussion.

17. SPAIN

Barriers:

- No barriers.

Gaps:

- The included information is just a small part of the total existing hydrogeological information (both in the research and knowledge categories) in Spain. It comprises some of the open existing documentation of the Geological Survey of Spain, some selected papers from the main research groups, and some of the publicly accessible data and reports from the national and regional administrations. There is still quite a lot of information that should be included in the inventory. Fortunately, much public

information are available. No information has been included that carries a cost, such as some manuals, guides or IGME books.

18. UKRAINE

Barriers:

- Main barriers are language and time.

Gaps:

- No gaps.

19. UK

Barriers:

- ESTEL: Groundwater Hydrology Model – output is a groundwater modelling software package, which is commercially licensed.
- African Groundwater Literature Archive – this is a searchable database of literature. Some papers included in it are not available for download, but bibliographic data is available for all papers.
- Historic Droughts – licence terms and conditions apply to some outputs.
- Groundwater Flooding Susceptibility – licence terms and conditions apply.
- Many of the journal/Special Publication papers are available through subscription or pay-per-view access, although some are also available via free online repositories.

Gaps:

- The coverage of our EIGR entries is not comprehensive for any of the entry types.
- The Geological Society of London (GSL) have included a large number of peer-reviewed papers, but the majority of these are from Geological Society of London Special Publications and the Quarterly Journal of Engineering Geology and Hydrogeology. This could be supplemented by browsing the contents of other hydrogeological journals for papers of UK relevance/coverage, via publicly accessible literature databases (e.g. GeoRef).
- GSL has included a few national databases, map and literature archives, technical reports and guidance documents, and cross-cutting research projects. We are not aware of any comprehensive sources of information about such research output types. The

British Geological Survey is a major holder of relevant data and would be able to provide further information about their holdings. Other organisations who may be able to advise on relevant projects and data sources (their own or others') are listed in the initial UK questionnaire return submitted in 2015. We hoped to include a wider variety of entry types, but have struggled to engage others in the community in this work.

- Other than the lack of comprehensive information sources about relevant research and datasets, a particular challenge is that many initiatives involve multiple institutions, including partners from different countries, and may cover geographical areas across more than one country. It is therefore difficult to build comprehensive coverage of European research by building up from a country-by-country basis. The project leaders may wish to look at strategies for data gathering across national borders.
- GSL would be happy to discuss further any of the issues raised here, or ways in which we might provide further additional advice.

4. SUMMARY AND CONCLUSIONS

The main outcomes from the KINDRA Country Reports can be summarized as follows:

1. The time required for one entry varies a lot from expert to expert (15-45 minutes). The collection of data and arrange them for the correct upload to the Inventory (e.g. literature studies, visits to various institutes and companies dealing with hydrogeology) took most of the experts working hours, especially for the publications on national languages which needed the translation of the relevant parts to English (e.g. abstract).
2. In order to collect the information relevant for the population of the Inventory, LTPs used different sources on national and regional level. These sources included:
 - Institutions supporting and monitoring hydrogeology-related research in general (e.g. Ministry of Environment);
 - Institutions dealing with groundwater research and/or survey (e.g. Geological Surveys);
 - Responsible governmental bodies (e.g. Nature Conservation Agency);
 - Hydrogeological archives and source databases;
 - Journals.
3. In order to classify the data LTPs used predefined classification of research and knowledge classes:
 - Class1 – Articles in peer reviewed journals occurring in WoS or Scopus databases only;
 - Class2 – Conference proceedings, monographs, book chapters etc. Found in WoS or Scopus extended databases (all entries);
 - Class3 – Reports from research projects, National technical journals etc. with internal or external QA (identified by EFG experts);
 - Class4 – Reports, data reports, popular journals, newsletter etc. with no certain QA (identified by EFG experts).

The overall entries are mostly related to class 3 and class 4. The reason for that was that National experts were focused on publications and data sources which are not available through the well-known and accessible data bases (e.g. Web of Science or

Scopus) and mostly belong to Class 1 and Class 2 in order to avoid copying already publicly available databases.

4. The topics of the data covered the wide range of publications grouped in several relevant domains:
 - National databases;
 - National and local reports containing facts and data;
 - Hydrogeological maps;
 - Technical reports, guidelines, manuals, etc.;
 - Books and book chapters;
 - Position papers and/or important papers on PR journals;
 - Others.

5. The main barriers in for finding and collecting data are:
 - Data concerning groundwater as a whole are outdated;
 - Scattering of the data among national, regional and local authorities;
 - Most of the relevant publications are in national languages;
 - Classification and selection of the data due to its abundance and evaluation of the relevance of the identified source;
 - Copyright and intellectual property issues;
 - Data are not publicly available;
 - Long-time gaps due slow communication with professional contacts.

6. The main gaps in finding information are:
 - Fractioning the information which makes data gathering more complex and difficult to have a whole picture;
 - Big amount of information and limited resources;
 - Lack of access to some critical sections of public sector which could provide extra details on groundwater research;
 - An important question is if KINDRA should aim at building a database including scientific research published in peer-reviewed papers and in QA-passed reports, or should focus on the publicly available data and modes;
 - Need for review and overview of the past and recent hydrogeological research on national level.

Revealing the problems and difficulties in the population of EIGR contributes to the simplification and improvement of the uploading process. The Inventory remains open to upload data after finishing Work Package 2, even after the end of the KINDRA project. It will be continuously maintained by EFG to include updates and allow for the increase of the geographical coverage. The EIGR register is intended to be deployed as a public-access service, as a permanent, searchable database on ongoing hydrogeological research in Europe. External users may also have access to the database that can support the formulation of the relevant policy and regulations.