RIS-ALiCE: Al-rich industrial residues for mineral binders in ESEE region

DELIVERABLE D4.1

Registries and databases review report

Lead beneficiary: Salonit Anhovo d.d.

Date: 31 August 2019

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1. INTRODUCTION

The "RIS-ALiCE" project, funded by EIT RawMaterials, is aiming to create a network of relevant stakeholders, in the area of currently unused and landfilled Al-rich industrial residues, which can be used for low-energy cement production. By interlinking cement producers, waste producers, research institutions and other stakeholders in the field we aim to get one step closer towards the production and use of Al-rich cement clinkers, the production of which uses much less energy as cements that are produced today.

Work Package 4 in the RIS-ALiCE project aims to develop an on-line registry of Al-rich waste materials in the ESEE region, which can be used by cement plants and waste holders, to better plan their future operations.

1.1 AIM AND PURPOSE OF THIS DOCUMENT

The aim of the deliverable D4.1 "Registries and databases review report" is to review a selection of existing similar and relevant databases, with a focus on existing mining wastes and industrial waste registries in Europe. In the review process a special attention is placed on their internal database structure, data content, data validation and intellectual property (IPR) issues. The usefulness of each selected register will be assessed by potential end-user (cement plant) and by an information technology (IT) expert. The outcomes of this task will thus serve as an input for creating of ALiCE registry of Al-rich wastes in Eastern and South-Eastern European (ESEE) region blueprints (D4.2).

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2. REGISTERS AND DATABASES

The selection of registries to be reviewed was done to select a whole spectrum of geological and waste material related registries and geo-related databases, from those that could be regarded as best practices, to those which cannot be considered as best cases. 18 registers and databases from the ESEE region, Europe and World were reviewed, that are:

- developed within different European projects;
- developed by industry or waste companies;
- developed by national geological surveys.

Table 1 presents the list of reviewed registries and databases. Each registry was assessed by:

- Registry purpose: whether it is relevant for RIS-ALiCE project;
- Content of the registry: its features and tools for users;
- Internal database structure: search and querying options, data content etc.;
- Reporting data, data content and data validation: whether to include, modify or remove data?, or whether data is up to date and relevant and similar;
- Map overview: features of map viewer (if exist);
- Metadata information available;
- Feedback: can user provide any kind of feedback;
- Opinion from the perspective of registry end-user (Salonit Anhovo d.d. cement plant);
- Opinion from IT expert (Lucis d.o.o.).

2.1 ASSESSMENT METHODOLOGIES

All listed registries have been assessed from the point of view of potential end user, with the special emphasis on relevant features, which can also be very useful for RIS-ALiCE registry. Potential end-users could be the same, as for the RIS-ALiCE registry: cement plants, waste holders, academia. Ideally it should be that the portal is user-friendly, navigation is easy and logical, data is relevant, up to date and easy to find, help and other information is available, and users can provide feedback. The other extreme situation (or case) is: poor performing registries usually does not have search option, data is missing, irrelevant or obsolete, no help is provided, structure is not logical or easy to follow, feedback is not possible and similar.

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At each of the registry a descriptive remark was given for each of the points. At the end we included an assessment of the usefulness of the registry from the potential user – cement plant, and IT expert.

Table 1. The list of registries and databases which are reviewed in D4.1.

	Register / database	**Link**
1	eGeologija	http://egeologija.si/geonetwork/srv/slv/catalog.search#/home
2	Registry of boreholes in Slovenia (beta version)	https://e-vrtina.si/
3	Registry of Slovenian holders of mining rights	https://ms.geo-zs.si/
4	Register of Al- and Si- rich industrial waste in Slovenia	no link (.pdf form)
5	Register of secondary by-products, steel waste enriched with metals and Al - and Si - rich industrial waste	no link (.pdf form)
6	European Pollutant Release and Transfer Register (E-PRTR)	https://prtr.eea.europa.eu/#/home
7	European Geological Data Information portal (EGDI)	http://www.europe-geology.eu/
8	European Minerals Knowledge data Platform (EU-MKDP) -Minerals4EU	http://minerals4eu.brgm-rec.fr/
9	IGME (Spanish geological Survey) geoscientific web sites and data catalog	http://info.igme.es/catalogo/catalog.aspx?catalog=2&shim=true&shdt=false&shtb=true&shtp=false&shfp=false&shsf=false&shfo=false&master=infoigme&lang=spa

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10	IGME Advances search system (ISE)	http://info.igme.es/ise/
11	MAP Viewer	http://info.igme.es/visorweb/
12	IGME Map services	http://mapas.igme.es/servicios/default.aspx?lang=eng
13	Italian mining waste registry	http://www.isprambiente.gov.it/it/banche-dati/strutture-di-deposito-di-tipo-a
14	OneGeology	http://portal.onegeology.org/
15	FLYASHDIRECT	https://www.flyashdirect.com/
16	Global Coal Plant Tracker	https://endcoal.org/tracker/
17	NTPC - A Maharatna Company	https://www.ntpc.co.in/en/ash-availability
18	EURARE	http://www.eurare.eu/countries/mediterranean Bauxites.html

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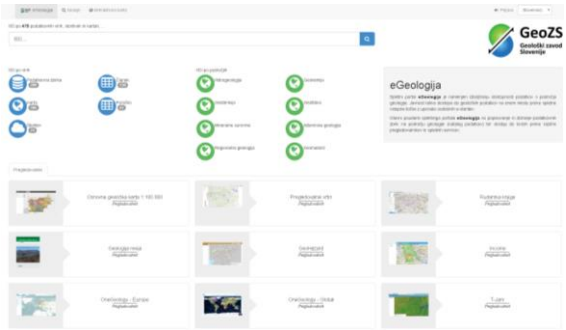
3. RESULTS

This chapter presents each of the registry by its assessment criteria. Each of the registry is assessed in a separate table.

eGeologija – registry of Slovenian geological information	
	
Registry access	http://egeologija.si/geonetwork/srv/slv/catalog.search#/home
Author	GeoZS (Slovenia)
Geographic relevance	Slovenia
Language	SL, EN (some parts of text are not translated to EN)
Purpose	eGeologija web portal is designed to improve the availability and accessibility of geological data. It enables the public to access the geological data in one place using modern e-services.
Site map	You can search over 280 data sets, services and maps etc. For viewing you can use different map viewers which are presented on the first page.
Internal database structure	You can browse by: - keyword - resources (article, dataset, service, map) - field (Hydrogeology, Geochemistry, Geothermics, Geohysics, Minerals resources, Engineering geology, Regional geology, Gohazard). Additionally, you can browse by: - scale - resolution - contact for the resource - representation types - formats

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	For every resource the following information is available: - date/time when the resource was last updated - overview of resource - accessibility of resource (downloads and links) - information about resource (keywords, contact for the resource) - technical information - metadata information
Reporting data, data content and data validation	/
Map overview	You can use the following functions: - search a place - add and manage different layers - unload different layers - print desired part of map - measure distance on map - zoom - zoom to initial map extent - zoom near your location - graticule
Metadata information available	Yes
Feedback options	You can rate each resource (using the symbol star)
Opinion from the end-user's perspective	Register with a well-designed and transparent search mode. Some parts of the registry are not translated to English. The non-translated sections contain some detailed explanations of individual contents.
Opinion from the IT expert	Register contains a search engine which delivers results fast. Infrastructure for map rendering, marking areas and plotting points is optimized and performs fast rendering. Click on point or area contains links to additional maps which are related to selected point or area. Based on getting fast results while using register, we can conclude that database is structured appropriately.

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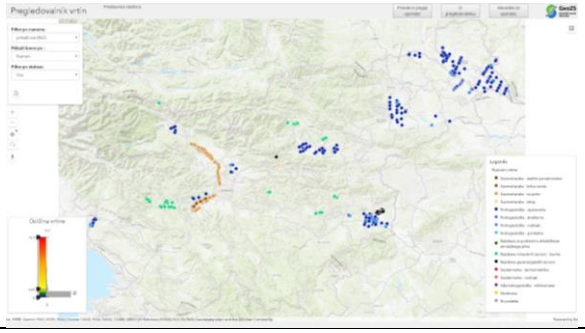
Borehole viewer in Slovenia (beta version)	
	
Registry access	https://e-vrtina.si/
Author	GeoZS (Slovenia)
Geographic relevance	Slovenia
Language	SL
Purpose	Obtain currently dispersed data about already drilled boreholes in various projects, collect them in a comprehensive database and edit them in a way that makes them accessible and useful to everyone interested. Registry contains basic data on already performed boreholes and research. For more detailed information about specific borehole you can contact the data owner (get the information in the viewer).
Site map	- terms and conditions of use - description of the browser - instructions for use of the viewer - search filters
Internal database structure	The data about boreholes are presented on map. It is possible to filter them according to purpose, status and length.
Reporting data, data content and data validation	Database contains basic data on already performed boreholes and related research. For more detailed information about specific borehole you can contact the data owner, contact can be obtained from the registry.
Map overview	The map view has the following functions: - display of boreholes on the map (possibility of different map layers) - boreholes divided according to purpose by colours (legend) - filtering according to purpose, status or length of borehole - filters for displaying boreholes according to their purpose (hydrogeological, geomechanical, mineral resource research) and status (all, only operating)

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	- possibility to use different basis of map - 3D rotation of map
Metadata information available	No.
Feedback options	No
Opinion from the end-user's perspective	Test version of viewer, although is working fine. Map view enables a quick overview of boreholes.
Opinion from the IT expert	Map rendering and plotting points is fast. Filtering engine performs fast map re-rendering. Point access shows information and additional links to documents that are related to the selected point.

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Registry of Slovenian holders of mining rights	
	
Registry access	https://ms.geo-zs.si/
Author	GeoZS (Slovenia)
Geographic relevance	Slovenia
Language	SL, EN
Purpose	Overview of Slovenian holders of mining rights.
Site map	The database contains locations and data of exploitation and research premises for which a concession contract is concluded under Slovenian legislation. Data areshown on a map or list. On the first page there is: - map overview - browser - contact
Internal database structure	When searching on the list the following filters can be applied: - exploitation site - concessionaire - municipality - mineral resource - illegal and abandoned quarries
Reporting data, data content and data validation	/
Map overview	Locations are marked with coloured dots. After clicking on dots additional information about the selected location is displayed. The map view has the following functions: - zoom - measure distance and area - full screen - possibility to use different layers (exploitation and research space, illegal and abandoned quarries, cadastre) and the basis (topographic background with

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	ortho-photo, relief DMR) - coordinates
Metadata information available	No
Feedback options	No
Opinion from the end-user's perspective	Registry where you can get basic data about the Slovenian holders of mining rights.
Opinion from the IT expert	Register's map rendering is quite fast. Point selection shows additional details and link to download the map. Fast zoom-in of selected point. Detailed view also uses library for rendering grid (durations of contracts).

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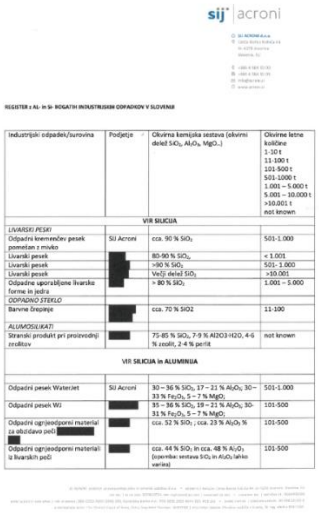
Register of Al- and Si- rich industrial waste in Slovenia



Registry access	no link (.pdf document)
Author	SIJ ACRONI
Geographic relevance	Slovenia
Language	SL
Purpose	Register provides information about Al- and Si- rich industrial waste in Slovenia
Site map	No.
Internal database structure	Table includes the following data: - type of industrial waste - name of company that produces waste - approximate chemical composition - approximate annual quantities
Reporting data, data content and data validation	Registry contains data about chemical composition: SiO_2, Al_2O_3, Fe_2O_3, MgO, $Al_2O_3xH_2O$, % zeolite, % perlite, TiO2
Map overview	No.
Metadata information available	No.
Feedback options	No.
Opinion from the end-user's perspective	Useful information about the material, annual quantities and producers can be obtained, and is also relevant for RIS-ALiCE registry.
Opinion from IT expert	Not relevant

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Register of secondary by-products, steel waste enriched with metals and Al - and Si - rich industrial waste

sij | acroni

Verzija 2 Jesenice, junij 19

SEKUNDARNI STRANSKI PROIZVODI, JEKLARSKI ODPADKI BOGATI S KOVINAMI in INDUSTRIJSKI ODPADKI BOGATI z Al in Si (leto 2018)

STRANSKI PROIZVODI

	Naziv stranskega proizvoda	Vrsta in lokacija nastanka	Okvirne letne količine nastalega produkta	Povprečna/okvirna kemijska sestava	Slika
	Agregat iz jeklarska navadne pečne (EOP C) žlindre [1]	jeklarna	30 000 t	34 % CaO, 17 % SiO_2, 11 % Al_2O_3, 8 % MgO, 18 % FeO, 3 % MnO, 3 % Cr_2O_3	

Certifikat 1404-CPR-3101 (tip: Certifikat o skladnosti tovarniške kontrole proizvodnje (CPR, SIST EN, 2+)

Obseg certifikata št. 1404 - CPR - 3101, izdaja 1 z dne 16. 1. 2019

Proizvodi:

Vrsta agregata	Standard	Vrsta materiala	Nazivne frakcije
Agregati za bitumenske zmesi in površinske prevleke za ceste, letališča in druge prometne površine	EN 13043:2002 EN 13043:2002/AC:2004	jeklarska žlindra EAF C	0/2, 0/4, 2/4, 4/8, 8/11, 11/16 mm
Agregati za nevezane in hidravlično vezane materiale za uporabo v inženirskih objektih in za gradnjo cest	EN 13242:2002+A1:2007		0/22, 0/45 mm

Registry access	no link (.pdf document)
Author	SIJ ACRONI
Geographic relevance	Slovenia
Language	SL
Purpose	Register provides information about secondary by-products, steel waste enriched with metals and Al - and Si - rich industrial waste
Site map	No.
Internal database structure	Table includes the following data: - type of industrial by- products/ waste - type and location of waste production and waste storage - estimated (rough) chemical composition - approximate annual quantities - images of the material
Reporting data, data content and data validation	Registry contains data about the chemical composition: CaO, SiO_2, Al_2O_3, Fe_2O_3, MgO, MnO,Cr_2O_3 $Al_2O_3xH_2O$, TiO_2
Map overview	No.
Metadata information available	No.
Feedback options	No.
Opinion from theend-user's perspective	Useful information about the material, annual quantities and producers can be obtained, and is also relevant for RIS-ALiCE registry.
Opinion from IT expert	Not relevant.

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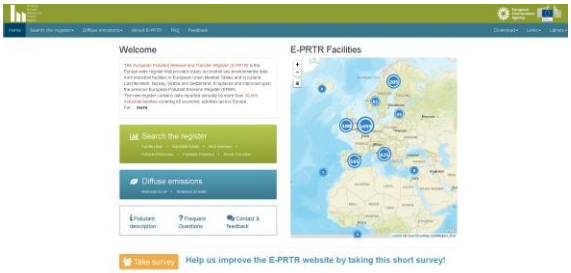
European Pollutant Release and Transfer Register (E-PRTR)	
	
Registry access	https://prtr.eea.europa.eu/#/home
Author	European Environmental Agency
Geographic relevance	28 EU Member States as well as Iceland, Liechtenstein, Norway, Serbia and Switzerland
Language	EN
Purpose	The European Pollutant Release and Transfer Register (E-PRTR) is the Europe-wide register that provides easily accessible key environmental data from industrial facilities in European Union Member States and Iceland, Liechtenstein, Norway, Serbia and Switzerland. The register contains annual data reported by more than 30,000 industrial facilities covering 65 economic activities within the following 9 industrial sector.
Site map	On the first page there is: - short presentation about E_PRTR - search the register - diffuse emission (database about the diffuse emission to air/ to water by different sectors and different pollutants) - FAQ (list of frequently asked questions) - download (where you can download instruction in your own language, what and how industrial facilities need to report) - library with glossary, pollutant description, information about waste reporting
Internal database structure	In register you can browse by: - country - region/ region basin district - year - facility level (name, location) - industrial activity (sector, activity, sub-activities) - pollutant releases and transfers (pollutant group, pollutant, releases to, transfers to) - waste transfers Diffuse emission registry:

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	- database about the diffuse emission to air and to water – you can search by different sectors and different pollutants
Reporting data, data content and data validation	Every facility needs to report data according to special instructions which can be downloaded from E-PRTR web page. The respective authorities in countries compile and check the quality of the reported data. The data are then provided to the European Commission and the European Environment Agency for compilation and dissemination on the E-PRTR website. Detailed information on the reporting procedures and content is available in the E-PRTR Guidance Document. The web site also contains description of methodology development for the spatial distribution of the diffuse emissions in Europe.
Map overview	Industrial facilities which report to E-PRTR register are marked on map: - facilities are marked with different colours (different colours for different activity sectors) - legend viewer - zoom
Metadata information available	We couldn't find information about metadata, so we regard this as not available.
Feedback options	Yes, via email (ENV-EPRTR@ec.europa.eu) or via short survey.
Opinion from the end-user's perspective	Register with very good defined reporting conditions. It also contains special documents that provides guidance on various reporting processes as set out in the E-PRTR Regulation. Possibility of advanced search.
Opinion from IT expert	Register rendering infrastructure contains engine for drawing and marking dispersion area. Map rendering performance is fast. Click on point opens detailed view with zoom in map. Accessing detailed view is quite fast.

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European Geological Data Infrastructure (EGDI)	
	
Registry access	http://www.europe-geology.eu/
Author	EGDI was funded by a number of EuroGeoSurveys members.
Geographic relevance	Europe
Language	EN
Purpose	EGDI is EuroGeoSurveys' European Geological Data Infrastructure. It provides access to Pan-European and national geological datasets and services from the Geological Survey Organisations of Europe. Through EGDI data from a number of European data harmonisation projects are accessible (Promine, M4EU, GEO CRADLE, ONE GEOLOGY, IGME5000, eENVplus, IHME1500, EEA, GEMAS in Europe, EMODnet, PanGeo, Terrafirma, EFEHR, SeismicPortal, EPOS, GEUS, EUOGA, GEOMOL, EUSR5000 etc.). EGDI was launched in June 2016 in a Version 1 and has since then been extended to include more data sets.
Site map	On the first page there are: - short presentation of EGDI -main geological topics - all content (using this you can browse all data sets in one single map) - metadata - about EGDI
Internal database structure	Content of the page is divided to main geological topics. By clicking on them we a get short presentation of selected geological topicand links to available maps. At each topic relevant links to project sites are available. It is also possible to browse all data sets in one single map viewer by clicking ALL CONTENT. Searching the site using the search bar or searching for even more data sets using the MICKA metadata catalogue is possible.
Reporting data, data content and data validation	Different geological datasets and maps.

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Map overview	While browsing for a specific geologic topic on complete data sets available, user has a map presenting the results, which has the following functions: - location - zoom - full screen. On the left side of the map a browser exists, where you can choose which data set you want to brows and there are also information about the data set you choose and link to the official site of European project.
Metadata information available	Yes
Feedback options	We couldn't find relevant address for a feedback.
Opinion from end-user perspective	A comprehensive database, but contains incomplete datasets. It is not easy to find a specific information of interest.
Opinion from IT expert	Register needs to optimize map rendering and plotting data, current map rendering is quite slow. Map rendering infrastructure contains a configurable map and data viewer, which supports different content and viewing point info. Map viewer is not scrollable when detailed view is opened, and windows overlay each other. Infrastructure is dependent on data availability, meanwhile map viewer for certain section does not work.

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European Minerals Knowledge data Platform (EU-MKDP) - Minerals4EU	
	
Registry access	http://minerals4eu.brgm-rec.fr/
Author	Minerals4EU project participants
Geographic relevance	Europe
Language	EN
Purpose	To provide data, information and knowledge on mineral resources around Europe
Site map	1. Data Search into the EU-MKDP 2. Map viewer 3. Minerals Yearbook 4. Foresight study 5. Metadata catalogue 6. News
Internal database structure	1. Data Search into the EU-MKDP (Mineral Resources Database and Knowledge Documents) to find the best data; search by keyword - refine search by different categories (by content type, type of document, occurrence type, deposit type, status of the mine/quarry) 2. Map viewer - to view the data inside the EU-MKDP and combine them with other data to create decision support map 3. Minerals Yearbook - view data for primary minerals production, trade, resources and reserves; and for secondary materials (search by country, commodity, category, data search) 4. Foresight study – data search by content type and type of document 5. Metadata catalogue 6. News
Reporting data, data content and data validation	Data about mineral occurrences, mineral deposits and similar, other related documents and studies.

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Map overview	Map viewer - to view the data inside the EU-MKDP and combine them with other data to create decision support map - zoom - coordinates - scale - full screen - information about the selected point - properties of displayed data layers - can add different data layers (Minerals 4EU Layers, Metadata catalogue, ProMine layers, Other layers, OGC layers) - legend of displayed data layers - search into the EU-MKDP - go to function - found location function
Metadata information available	Yes
Feedback options	We couldn't find relevant address for a feedback.
Opinion from end-user perspective	Although comprehensive database, it contains incomplete datasets. It is not easy to find a specific data of interest.
Opinion from IT expert	Search engine partially supports localized search. Content entries need to be provided for each language to support full localized search. Map rendering needs an optimization, because the current one is slow (Bing infrastructure). Points are not very useful because they don't provide any detailed information. Yearbook display performance is fast, search engine over yearbook data is also fast. We can conclude that register contains an engine for calculating and aggregating yearbook data.

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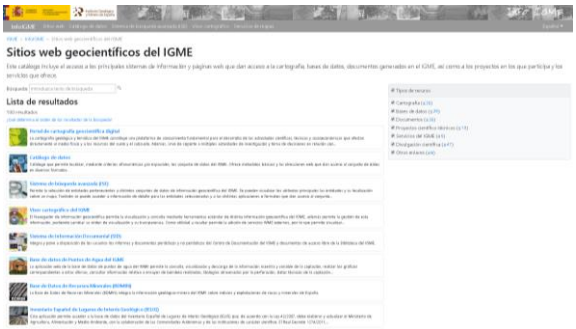
IGME (Spanish Geological Survey) Data Catalog	
	
Registry access	http://info.igme.es/catalogo/catalog.aspx?catalog=2&shim=true&shdt=false&shtb=true&shtp=false&shfp=false&shsf=false&shfo=false&master=infoigme&lang=spa
Author	IGME
Geographic relevance	Spain
Languages	ES, EN, FR, DE, PT (some parts are not translated completely)
Purpose	Serving Spanish geoscientific data.
Site map	Here you can easily discover geoscientific web applications and sites. Portal includes a list of web applications with short descriptions. After clicking the web application is opened. User can also discover more than 2200 spatial datasets, and evaluate their suitability for a purpose and get links to the dataset in different formats.
Internal database structure	List of web sites. It is also possible to search by: - keywords - spatial filter - types (cartography, databases, documents) - topics - formats of downloading file
Reporting data, data content and data validation	All kinds of (searchable) geological data, relevant for Spain.
Map overview	No map available.
Metadata information available	Yes. Basic metadata for the datasets (name, abstract, spatial domain, relevant dates, etc.) and access to the available distributions (online accesses to the data in different formats or related webpages or services).

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Feedback options	Yes.
Opinion from end-user perspective	They have very extensive collection of data which are presented in different catalogues (published on their web page). Complete web page is very well organised with all necessary data. A selection of specific modules will be presented in the next tables.
Opinion from IT expert	Page content needs to be provided for multiple languages to fully support page translate. Register contains links to multiple sites. Search engine partially supports localized search. To support fully localize search contents it needs to be provided for each language separately.

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IGME Advances search system (ISE)	
	
Registry access	http://info.igme.es/ise/
Author	IGME
Geographic relevance	Spain
Language	ES, EN
Purpose	To view and search available geological data on map.
Site map	Query entities from different datasets. It is possible to display the main attributes of the entities and its location on a map. It is also possible to access detailed information on entities and the URLS to access the dataset in different formats.
Internal database structure	It is possible to search by: - keywords, - topics, - spatial filter.
Reporting data, data content and data validation	Maps, databases, documents
Map overview	No.
Metadata information available	We couldn't find information about metadata, so we regard this as not available.
Feedback options	Yes.
Opinion from end-user perspective	They have very extensive collection of data which are presented in different catalogues (published on their web page). Complete web page is very well organised with all necessary data.
Opinion from IT expert	Register contains fast map rendering (Google infrastructure). Needs an optimization on selecting searching area.

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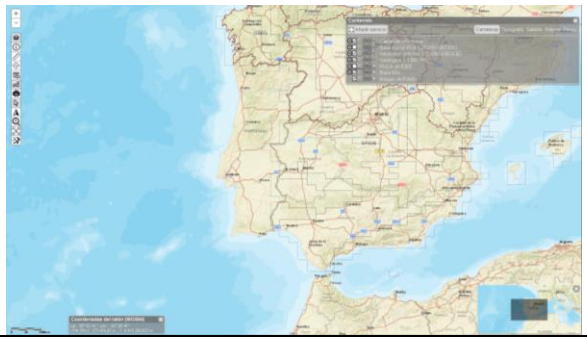
IGME MAP Viewer	
	
Registry access	http://info.igme.es/visorweb/
Author	IGME
Geographic relevance	Spain
Language	ES
Purpose	To view and search available geological data on map.
Site map	Display map services and identify features, add WMS and ArcGIS Server services, access to additional information for the layers (metadata, legend, etc.) and identified features (reports, pictures, etc).
Internal database structure	No search is implemented.
Reporting data, data content and data validation	Maps.
Map overview	You can use following functions: - zoom - coordinates - scale - full screen - information about the selected point - print desired part of map - scale - legend - can add different data layers - properties of displayed data layers

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Metadata information available	No.
Feedback options	Yes.
Opinion from end-user perspective	They have very extensive collection of data which are presented in different catalogues (published on their web page). Complete web page is very well organised with all of the necessary data.
Opinion from IT expert	Search engine makes fast searches from different resources with links to them.

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IGME Map services	
	
Registry access	http://mapas.igme.es/servicios/default.aspx?lang=eng
Author	IGME Spain
Geographic relevance	Spain
Language	ES, EN, FR
Purpose	Map services
Site map	This site lists all the web map services provided by IGME. It includes a brief description, a map to preview the dataset and the WMS, ArcGIS Server, KMZ and ArcGIS Online addresses.
Internal database structure	/
Reporting data, data content and data validation	/
Map overview	No.
Metadata information available	Yes.
Feedback options	Yes.
Opinion from end-user perspective	They have very extensive collection of data which are presented in different catalogues (published on their web page). Complete web page is very well organised with all the necessary data.
Opinion from IT expert	Page contains a listing of web services, while no additional elements (maps, search…) can be found.

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Italian registry of mining waste	
	
Registry access	http://www.isprambiente.gov.it/it/banche-dati/strutture-di-deposito-di-tipo-a
Author	Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA)
Geographic relevance	Italy
Language	IT, EN
Purpose	This section of ISPRA's website aims to facilitate the access to databases of mining waste created and managed by the institute, in the light of the INSPIRE Directive and in accordance with the EU legislation. Currently, there are 53 databases.
Site map	Basic information about each of the mining waste deposit is provided, together with geographical coordinates, types of waste and other information. There is no data about chemical and physical properties of the deposit.
Internal database structure	Aggregated data the form of maps, and raw data in tabular form can be downloaded.
Reporting data, data content and data validation	No information.
Map overview	No clickable maps available.
Metadata information available	No
Feedback options	No

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Opinion from end-user perspective	Very basic registry. No possibility of advanced search. Might be relevant for RIS-ALiCE in case there are abandoned bauxite or other Al-rich tailings, but due to lack of appropriate search and query option, it would be hard to extract relevant data.
Opinion from IT expert	Register needs improvements on maps, currently maps are not interactive and are provided as pdf documents. Page is not maintained, it uses outdated technology.

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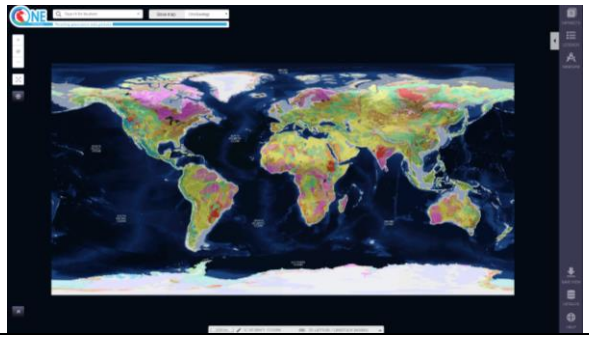
OneGeology	
	
Registry access	http://portal.onegeology.org/
Author	One Geology project
Geographic relevance	Worldwide
Language	EN, FR
Purpose	It is an international initiative of the geological surveys of the world who are working together with the support of international organisations, regional organisations and industry sponsors.
Site map	On the first page there are: - portal One Geology, - technical information on how to share data on portal, - metadata - other data about the project (members, global meetings, governance)
Internal database structure	Geological map of the world containing over 480 datasets, services and maps.
Reporting data, data content and data validation	Different geological datasets.
Map overview	The portal (map) has the following functions: - switch mode map/globe, - zoom, - full screen, - get Information tool, - coordinates of position, - scale of map, - measure distance and area on map, - saving the view you have created, - multi-layer map view, -opacity selection, - legend viewer, - details of provider organisation / geological survey,

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	- web link URL to the provider survey, - brief description of the data layer, - conditions of use information for each layer.
Metadata information available	Yes
Feedback options	Yes, via email.
Opinion from end-user perspective	The portal provides a good and harmonised information about the global geological structure, as well as a more local one. Some layers can not be activated. However, it is a good start for casual use, however, for an use by experts it still need some improvements (i.e. proper documentation, better description of lithological units etc).
Opinion from IT expert	Register uses fast location search tool with engine to suggest available locations. Map rendering may need some improvement on rendering speed.

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FLYASHDIRECT	
	
Registry access	https://www.flyashdirect.com/
Author	WASTE MANAGEMENT
Geographic relevance	North America
Language	EN
Purpose	FlyAshDirect, a service of Waste Management, creates by- product utilization opportunities for the power generation industry by developing markets for fly ash and synthetic gypsum resources. They serve the needs of coal-fired power plants and the building products industry by developing reliable markets for fly ash and other valuable coal combustion by-products (CCPs). WASTE MANAGEMENT is the leading provider of comprehensive waste management services in North America, providing services that range from collection and disposal to recycling and renewable energy generation.
Site map	On the first page different solution how to use FlyAsh are presented: - in concrete; - in Flowable Fill; - as a Soil Amendment; - in Mine Reclamation. FlyAshDirect has developed a carbon patented chemical treatment process that makes most fly ash suitable for concrete product regardless of Carbon content. By clicking on source, the map opens.
Internal database structure	Sources of materials are presented on Map or in list. First information (out of map or list) that we can get: - name of factory, - address of factory, - type of material they are producing. After clicking on the Name of factory we received information about: - the inventory by silos, - the daily analysis of material

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	- contact data - some additional documents (some cases). It is also possible that you can create an account to receive email about the inventory of a factory you are interested.
Reporting data, data content and data validation	Producers update daily analysis which contains the following parameters: - Fineness - Foam index - LOI (%) - Specific Gravity - Moisture For monthly mill reports we need to contact a responsible person via email. However, data about daily analysis and silos inventory seems not to be up to date.
Map overview	You can check the producers on map (google map application) where you can zoom in the location of factory.
Metadata information available	No
Feedback options	Yes
Opinion from end-user perspective	Data about the inventories and daily analyses are not updated. Some data are from year 2016, only one factory updated data in spring 2019.We believe that this is a good database of fly ash producers. Also, the concept of silo inventory and daily analysis is promising, but a lot of work is needed to update data daily. We think it is more appropriate to put down the estimated (rough) chemical composition of material and approximate annual quantities. The data in this registry is also relevant for RIS-ALiCE project.
Opinion from IT expert	Register contains fast map rendering (based on Google infrastructure). Click on point opens detailed view which contains additional information and links.

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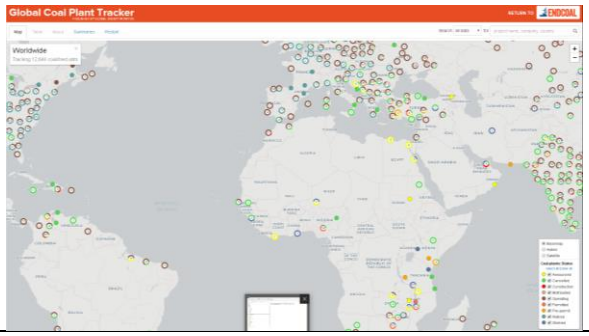
Global Coal Plant Tracker	
	
Registry access	https://endcoal.org/tracker/
Author	Published by Global Energy Monitor (formerly CoalSwarm),
Geographic relevance	World wide
Language	EN
Purpose	The Global Coal Plant Tracker provides information on all existing coal plants of 30 MW or larger, as well as every plant proposed since January 1, 2010.
Site map	After opening the web page, you get the browser where you can select a region and then a country or group of countries
Internal database structure	You can use map view or list view. The tracker uses a two-level system for organizing information. Summary information including location, status, plant name, sponsor, size, and carbon dioxide emissions. For further detail, each unit shown on a map or in a table is linked to a wiki page on SourceWatch or Global Energy Observatory.
Reporting data, data content and data validation	The tracker was designed and produced by CoalSwarm. The information in the tracker has been verified by activists and researchers familiar with particular countries.
Map overview	The portal (map) has the following functions: • zoom • legend viewer Plants are marked with coloured dots which indicates the status category of plant (announced, pre-permit development, permitted, construction, shelved, cancelled, operating). After clicking on coloured point we get more detailed information about the selected plant.
Metadata information available	We couldn't find information about metadata, so we regard this as not available.
Feedback options	Yes you can send information about errors or missing projects to Ted Nace via email.

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Opinion from end-user perspective	There is no data about the inventory of material or approximate annual quantities, chemical composition of material and no direct contact.
Opinion from IT expert	Register map viewer performs fast rendering (Google infrastructure). Point access provides additional information with fast “zoom in” action. Table view does not contain search engine, search over all entries can be difficult. Map’s search engine is performing fast results and triggers fast map rerendering.

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NTPC - A Maharatna Company	
	
Registry access	https://www.ntpc.co.in/en/ash-availability
Author	A Maharatna Company - India's largest energy conglomerate. The total installed capacity of the company is 55,126 MW (including JVs) with 21 coal based, 7 gas based stations, 2 Hydro based station and 1 Wind based station.
Geographic relevance	India
Language	EN
Purpose	The Maharatna Company published ash availability produced in their plants.
Site map	On their official web page they have a section where they publish a list of ash availability in their plants.
Internal database structure	They have published a stock of each type of ash available at NTPC Stations on June 30, 2019. In the list the following data are presented: - name of the coal based thermal power station - state - fly ash availability in tons - stock of bottom ash in tons - stock of ash pond in million tons - contact person & designation - contact number. They have also published a procedure for supply of Ash from NTPC Thermal Power Plants.
Reporting data, data content and data validation	Company refreshes stock information approximately every two months. During our research we notice two data updates on 30.4. and 30.6.2019.
Map overview	No map available, only tabular version.
Metadata information available	No

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Feedback options	No
Opinion from end-user perspective	The list is created by a private company. Good practice, only the estimated (or rough) chemical composition of materials is missing. The data contained herein is also relevant for the RIS-ALiCE registry.
Opinion from IT expert	Simple tabular view (no map, search etc.).

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EURARE	
	
Registry access	http://www.eurare.eu/countries/mediterraneanBauxites.html
Author	EURARE project
Geographic relevance	Europe
Language	EN
Purpose	The main goal of the EURARE project was to set the basis for the development of a European Rare Earth Element (REE) industry. They were investigating REE mineralisation in circum - Mediterranean Bauxites.
Site map	/
Internal database structure	On the official web site of the project we can find Map of European REE mineralization. This map also points to places in Europe where REE could be extracted from the red mud waste that is produced from the Bayer process. By clicking on marked place, we get information about the location of deposit, deposit name, type of deposit and in what way they extract REE.
Reporting data, data content and data validation	Data was collected as part of the project EURARE.
Map overview	Map shows all individual examples of REE mineralisation in Europe that were identified by the EURARE project.
Metadata information available	No.
Feedback options	No.
Opinion from end-user perspective	This complete project was focused on REE so there is no specific data about red mud.
Opinion from IT expert	Register needs improvements on displaying maps. Currently the register does not contain any viewer, maps are displayed as images. Interactive maps should be implemented to provide additional detailed information about points and marked areas.

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4. RECOMMENDATIONS FOR RIS-ALICE

This chapter provides conclusions, based on reviews of selected registries, with an emphasis on possible solutions for RIS-ALiCE registry.

3.1 REGISTRY FUNCTIONS

Search options

A very important property of every good registry/database is that it is **user friendly**. That means that registry design is simple, transparent, logic to use and has a possibility of **advanced searches and queries.** The most frequent search options in reviewed registries were searches by:

- keywords,
- type of material,
- location/country,
- field/topic.

It is very helpful from the end-user's perspective, that the registry also contains some **instructions** how to use registry and which function and search option are available. Some of the reviewed registries even have special section with a list of frequently asked question – FAQ (e.g. E-PRTR registry, Global Coal Plant Tracker). In case of registry data presentation on the map, **data export** feature for all or only for the selected dataset or areas can be very useful.

Form of registry

In registries the data can be presented in **tabular** or in **map form**. Some of reviewed registries have both possibilities (e.g. E-PRTR registry, FLYASHDIRECT, Global Coal Plant Tracker,…), others have data presented only in list form (e.g. NTPC – A Maharatna company, Register of Al- and Si- rich industrial waste in Slovenia, Register of secondary by-products, steel waste enriched with metals and Al - and Si - rich industrial waste,…). If only tabular form is presented, it has to contain **global geographical coordinates** of data entries.

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Language

In most reviewed registries English language is used. The exceptions are national registers where first language is the official language of the country, where registry is prepared and the other language used is usually English. In cases where the registry is multilingual, some parts are not translated – usually the main template of registry is translated, but the data content is not. The biggest language selection has the registry of Instituto Geologico y Minero de Espana - we can choose between five different languages (ES, EN, FR, DE, PT). It is recommended that core registry language, when presenting data from Europe (geographically) is **English**, while parts or whole registry can be translated to local languages.

Sharing data on registry

Data which is published in registries need to be prepared and published in the **format specified by the registry editor**. Comprehensive and clear **instructions** are needed. Examples:

- E-PRTR registry has published special a document E-PRTR Guidance Document that provides guidance on various reporting processes as set out in the E-PRTR Regulation. This document is available in 22 different languages.
- FLYASHDIRECT REGISTRY has published contact form where you can get informationon how to add your data into registry.

Data prepared and published in standardized form/structure **allows the user to compare information**. Important function regarding publishing data is also **the option to update or upgrade data.**

IPR – The protection of intellectual property rights

Some registries include instructions on how to use/quote their data. Examples:

- Registry of Instituto Geologico y Minero de Espana has published specific document about this- Conditions governing the public use and dissemination of the information for re-use of the IGME data.
- Borehole viewer anyone who publishes or summarizes the data from the viewer should provide publication with an information about of the data source (Source: e-vrtina.si - Public Surveyor of the Republic of Slovenia, GeoZS). The same applies if the information is reused using network services.

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User feedback

A lot of reviewed registries have the option for theend users to give their feedback about the application or presented data. There are several ways to get feedback from the users:

- **via email** (e.g. registry of Instituto Geologico y Minero de Espana),
- **via short survey** (e.g. E-PRTR registry),
- **the option to rate the data content** (by marking the appropriate number of stars, e.g. eGeologija).

4.1 DATA IN RIS-ALICE REGISTRY

The quantity of data contained in the registry varies depends on the purpose of the registry. Registries that contain data about mining and industrial waste registries should provide at least the following information, in order to be useful for the cement production purposes:

- **type of the material,**
- **chemical composition of the material,**
- **description of the material which also includes the legal status of material,**
- **location of the waste origin and storage of material,**
- **name and address of the producer or provider,**
- **contact of the producer or provider (contact person/department),**
- **available quantity of the material.**

The following industrial waste registries were included in this review:

- Register of Al- and Si- rich industrial waste in Slovenia (SIJ ACRONI) – only list form (.pdf).
- Register of secondary by-products, steel waste enriched with metals and Al - and Si - rich industrial waste (SIJ ACRONI) – only list form (.pdf).
- FLYASHDIRECT (Service provided by WASTE MANAGEMENT) – list and map form.
- Global Coal Plant Tracker – list or map form.
- NTPC - A Maharatna Company – only list form.

Global Coal Plant Tracker registry does not include data about the material (type of material, quantities, chemical composition) and direct contact of the producer.

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FLYASHDIRECT registry operates with a comprehensive and useful registry of fly ash producers in North America. They used a concept of silo inventory on location and daily analysis of fly ash. Because of this concept a lot of data is not regularly updated. It might be more appropriate to present an estimated (or rough) chemical composition of material and approximate annual quantities and assure that this data is updated at least once a year.

SIJ ACRONI registries is in .pdf format and includes estimated (or rough) chemical composition and approximate annual quantities.

NTPC - A Maharatna Company registry includes data about the stock of all their materials in all their coal based thermal plants on specific dates. They have also published a procedure for the supply of material from their plants.

5.1 IT RECOMMENDATIONS

To meet the registry requirements and functions it is important to implement search engine which provides fast results. Search performance depends on database performance and design. It is recommended to use relational database and optimize search performance using database indexes. Map viewer and map render should also produce fast result. It is recommended to choose appropriate technology for rendering certain amount of data and to achieve quick access for detailed viewing. A service for fair data sharing needs to be implemented in the registry.

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5. CONCLUSIONS

Task 4.1 in the RIS-ALiCE project was dedicated to review existing mining waste and industrial waste registries in Europe and in the World to get the initial information regarding the database structures and data contents which will help us to create an RIS-ALiCE registry, containing data about Al-rich industrial waste and mining residues in the ESEE region. This data will be required by the cement producers in order to begin the production of Al-rich cement binders, which production needs less energy than the production of standard cement clinkers. This document (D4.1) presents the results of task 4.1.

The most important features of RIS-ALiCE registry: (should be):

- It must be user friendly.
- Must contain relevant and updated data.
- Has to Contain search function and allows export of queries in georeferenced system.
- Has to Contain instructions on how to use the registry and how to update data.
- Has to Allow new users to provide their own data.
- Has to have clear IPR rules.
- Has to Allow users to provide feedback easily.
- uses generally used language (i.e. English).

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