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

DELIVERABLE D4.3

EITRM103040: ALiCE on-line registry prototype report Lead beneficiary: Lucis, d.o.o.

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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 unutilized and landfilled aluminium containing industrial residues and make use of them 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 low-CO₂ cement clinkers which are produced with far less energy than cement that is on the market 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 dedicated for cement plants and waste holders to help them better plan their future operations (Figure 1). At first, the work schedule in developing this registry was to review similar existing solutions (T4.1). The output of T4.1 served as a basis for the registry blueprints (T4.2), which allowed the creation of the actual registry prototype (T4.3). The primary purpose of T4.3 was to create and launch the registry prototype and populate it with data. This document will focus on describing the register's technical specification and data input procedures. In further steps, the recorded feedback will allow the RIS-ALiCE consortium to improve the initial registry prototype to better suit the needs of end-users (i.e. cement plants, waste holders/producers etc., T4.4), and to launch the final version of the registry to ESEE area (T4.5).

The RiS-ALiCE registry prototype will be accessed via RIS-ALiCE web page, but also directly via provided URL. This has not yet defined, as the domain is not purchased at the moment, but this will be arranged until the registry becomes final in M24. Therefore the registry, for the purpose of external testing, can be temporarily accessed (as in June 2020) via the following URL: https://alice.dev.lucis.si/.

<table>
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<tr>
<th>T4.1</th>
<th>Review similar registries</th>
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<tr>
<td>T4.2</td>
<td>Create registry blueprints</td>
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<tr>
<td>T4.3</td>
<td>Prepare registry prototype</td>
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<tr>
<td></td>
<td>Populate it with data from SI, HU and BiH and test it on workshops</td>
</tr>
<tr>
<td>T4.4</td>
<td>According to the feedback create final version of the registry</td>
</tr>
<tr>
<td>T4.5</td>
<td>Launch final version to ESEE area</td>
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Figure 1. The workflow diagram for WP4. Activity in the chain of events towards the final registry described in this report is marked with red.
1.1 AIM AND PURPOSE OF THIS DOCUMENT

The aim of the deliverable D4.3 (that is the Registry prototype) is to build the first implementation of the RIS-ALiCE registry. For this, the data structure, content, validation protocols, material valorisation methods, user rights and other IPR issues, described in document D4.2 document, were implemented in D4.3 registry prototype and are now ready for the initial end-user testing. Later on, as usually is the case with the software user manuals, the software platform, user interfaces, data searching and retrieving methods will also be described.

The scope of this document is to specify the registry prototype from a technical and user perspective. However, the project consortium will populate the RIS-ALiCE registry with data in later stages of development, when we assume the potential upgrades and fixes will also arise. This iterative process will allow us to fine-tune the register, leading us to achieve its full usefulness. We expect the final version of the registry might differ from what we are now presenting in the document, as it will depend on the end-users feedback.

2. METHODOLOGY

1. We developed the registry prototype by following the waterfall model. Based on the input document, marked in D4.2, we designed and then implemented the registry itself.
2. The waterfall model is useful when building a well-defined, documented and accurately scoped product, as it was in the case of RIS-ALiCE registry.
3. A typical waterfall process goes as shown in the Figure 2.
4. Currently (as in June 2020) the registry is implemented and internal verification was conducted by LUCIS. In the second part of 2020 we will conduct external verification stage, which will be done by RIS-ALiCE partners and other interesting stakeholders. Future phases of RIS-ALiCE registry development will most likely adopt an agile development methodology (i.e. SCRUM). Shorter development cycles, which iterate over end-user requirements, end up with a more refined and user-friendly product.
Figure 2. The waterfall process for registry implementation.

3. RIS-ALiCE REGISTRY PROTOTYPE

The registry prototype was build following the waterfall model:

1. **Requirements** based on document D4.2 (i.e. Registry prototype blueprints);
2. **Design**, including the high-fidelity wireframes, representing the mockups, and defining the data model based on #1.
3. **Prototype software implementation**, developed by Lucis.
4. **Verification has two stages:**
   a. Internal testing (done)
   b. External testing (to be done by consortium partners)
5. **Maintenance** (TBD)

3.1 WIREFRAMES/MOCKUPS

Using high-fidelity wireframes or mockups makes the process of implementing a software product more straightforward and faster as the developers can follow a graphic representation of the end product.

Examples of mockups are presented on Figures 3-5.
Figure 3. The mock-up of the sign-in form
Figure 4. The mock-up of company registration
3.2 ARCHITECTURE

The register is implemented by using all open-access software, including **PHP 7.3**, using relational **MySQL** database for storing the main configuration of the input details and the register data itself. The mentioned technology stack runs on a **Linux** operating system.

The application is built on **OctoberCMS** platform, using cutting-edge PHP technology stack, with **Laravel 5.5** at its core.

Such configuration allows high-performance, functionally complex code with quicker and easier maintenance and development. What is more, it enables us to expand its functionality by using **Laravel API**.

The backend enables users, upload forms and email content management.

The administrator can change the labels, sort orders and units in majority cases of the input fields.

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**Figure 5.** The mock-up of the map
The RIS-ALiCE registry has security implicitly integrated. All connections will be safe, using an appropriate server site certificate and enabling https. All passwords will be kept in an encrypted manner.

The front-end portal enables:

- Registration, profile management, user management (for a company admin).
- Input/manage data is separated into the tabs for a better user experience.
- Upload files (pdf, png, tiff, doc, docx) and images.
- Browse and filter data in a tabular view.
- Display data on the OpenStreetMap, search/filter data by company name, hazards.
- Export to the xls file format is available.

Core components:

- **PHP**: The PHP (recursive acronym for PHP: Hypertext Preprocessor) is a widely-used open source general-purpose scripting language that is especially suited for web development, and can also be embedded into HTML ([https://www.php.net/manual/en/intro-whatis.php](https://www.php.net/manual/en/intro-whatis.php)).
- **MySQL**: The world's most popular open-source database. ([https://www.mysql.com/](https://www.mysql.com/))
- **OctoberCMS**: October is a free, open-source, self-hosted CMS platform based on the Laravel PHP Framework. Thousands of digital studios and freelancers all over the world love October for its simplicity, flexibility and modern design. ([https://octobercms.com/](https://octobercms.com/))
- **Laravel API**: Laravel is a free, open-source PHP web framework, intended for the development of web applications following the model–view–controller (MVC) architectural pattern. ([https://laravel.com/](https://laravel.com/))
- **OpenStreetMap**: OpenStreetMap is a collaborative project to create a free editable map of the world. The geodata underlying the map is considered the primary output of the project. ([https://www.openstreetmap.org/](https://www.openstreetmap.org/))

### 3.3 USER MANAGEMENT AND USER ON-BOARDING

**User management**

We have built the on-boarding and management functionality by keeping in mind the schematic representation (Figure 5) from the document *Registry blueprint*. We are developing the user management in October CMS which allows a fine-grained segmentation of users based on user groups and permissions.

**User levels**

- **System admin or root**: have permissions to administer the hosting operating system (Linux) and all infrastructure modules.
- **MySQL admin**: have permissions to administer the hosting database.
- **Registry administrator/root**: have permissions to manage October CMS (demo link: http://alice.lucis.si/backend/backend).
- **Registry administrator/power user**: Administer the registry functionalities and confirm new users and company admins.
- **Company admins**: Administer company account, including registered users and documents/data.

**Figure 6 presents an example**: Lucis d.o.o. company registry administrator. User displayed parameters are presented on Figure 7, user details on Figure 8, super-user flag ON as company administrator on Figure 9, user groups dialog on Figure 10 and permissions page on Figure 11.

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**Figure 6. An example of users administrator page.**

**Figure 7. User displayed parameters dialog.**
Figure 8. User details dialog.

Figure 9. Super-user flag ON as company administrator example.
Figure 10. User groups dialog.

Figure 11. Permissions management system.
Figure 12. A schematic representation of RIS-ALiCE registry user management. * - another way for this can be arranged is that each country has its registry administrator (figure taken from RIS-ALiCE D4.2)

Users on-boarding flow

A new user begins their sign-up journey by clicking a *sign-up* button on the register landing page. Then, the user is requested to fill a set of data (personal, company, etc...), Figure 13). After one confirms the entered data by clicking on the button *register*, the request waits until the portal admin (company or registry) approves it. After user-approval and confirmation, the user receives a confirmation email, containing further instructions.
Figure 13. New user sign-in page.
User can sign-in by clicking the *sign-in* button on the registry landing page (Figure 14), and filling-out username and password:

![User login](image)

**Figure 14.** RIS-ALICE registry login page.

### 3.4 WASTE, MEASUREMENTS AND LOCATION DATA UPLOAD

The central register form aims to upload all necessary data to add a new waste location, including all measurements, documents and location data as specified in the document D4.2 registry blueprint. For this reason an upload form has been prepared (Figure 15), where:

- mandatory fields are marked with a red dot,
- input fields are self-explanatory named to ease the input procedure,
- some input fields are dynamically generated to accommodate a wide range of measurements (Figure 16),
- location is defined by longitudinal and latitudinal coordinates (Figure 17) and
- additional documents can be uploaded as conformity proof etc. (Figure 18).
Figure 15. An example of an empty data upload form.
Figure 16. An example of dynamic input field.

Figure 17. Location input dialog, containing longitudinal and latitudinal coordinates.
3.5 SEARCH AND DATA VISUALIZATION

RIS-ALiCE registry enables the user to perform a detailed search over most of the inserted values. In case of a general search, a simple but powerful context search is available as well (Figure 19). When a specific search result is clicked, it is displayed in a detailed and ordered way, including a map (Figure 20).

Figure 18. Additional documents input form.

Figure 19. Search dialog.
4. **FUTURE STEPS**

Based on the recorded feedback, Lucis d.o.o. will prepare the final version of the registry (M24), which will be launched to the whole ESEE area by Vinča institute (VINS) with the help of all RIS-ALiCE partners.

5. **CONCLUSIONS**

This document presents the RIS-ALiCE registry prototype. Next development iterations will focus on fine-tuning of the current prototype until the final version is ready for roll-out.