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Report on interactions with stakeholders/end-users
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Abstract

This deliverable summarises the interactions that took place between stakeholders, end-users and consortium partners of Work Package 5 (WP5), titled “Innovation in liquid organic waste treatment and conditioning”, throughout the course of the PREDIS project.

The report provides an overview of the stakeholder engagement framework within PREDIS, including the list of registered End User Group (EUG) members of Waste Management Organisation (WMO) and Radioactive Waste Producers (RWP) interested in the research subject of WP5.

The report also outlines the key activities and engagement channels implemented to facilitate interaction between stakeholders, end-users and WP5 partners, and to provide feedback and information (in the form of qualitative and quantitative data) throughout the project’s development.

Keywords
Stakeholders, end-users, engagement, interaction

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Executive summary

In line with PREDIS's commitment to raise awareness of predisposal activities, and to develop technology and generate outcomes aligned to the needs and challenges of end-users and stakeholders, a variety of activities and good practices were implemented over the past 4 years of the project to interact with stakeholders and end-users.

Work Package 5 "Innovations in liquid organic waste treatment and conditioning" (WP5) has prepared this report aiming to provide examples of how WP5 gained insights, feedback and maintained continuous communication with the stakeholders and end-users of the project.

The report is structured into two parts. The first section outlines the framework of stakeholder engagement across the PREDIS project and introduces some key concepts.

The second part of the report describes the practices, tools and activities deployed by the WP5 partners at each stage of the project, to support an effective stakeholder engagement. It also explains how the results and feedback from these interactions were used in the tasks of WP5.

1 Introduction

The PREDIS (Pre-disposal management of Radioactive Waste) project aims at developing and increasing the Technological Readiness Level (TRL) of treatment and conditioning methodologies for radioactive wastes for which no adequate or industrially mature solutions are currently available, including metallic materials, liquid organic waste and solid organic waste [1].

PREDIS implemented a stakeholder engagement strategy across the entire project, enabling the exchange and collaboration with stakeholders and end-users, by gathering feedback, insights and data from them. These actions have opened up channels with WMOs, waste owners, generators and regulators, who have provided input that enables PREDIS to verify that the tasks within the work packages address the correct needs and criteria in the R&D activities.

1.1 Framework of the Stakeholder engagement within PREDIS

The PREDIS project has maintained a consistent engagement with those potentially impacted or interested in the project since 2020. A wide range of activities for consultation, information dissemination and participation have been implemented. Commonly these activities become a one-time set interaction during the planning phase of a project. However, in PREDIS, these activities have been consistently implemented throughout the entire duration of the project.

1.2 Difference between Stakeholders and the End User Group

Stakeholders' community in PREDIS comprise national and international organisations, as well as individuals with interest in pre-disposal, who may be directly or indirectly affected by the project results and who may have the ability to influence the project outcomes. Stakeholders include regulators, research groups, universities, supply chain companies, civil society, among others. Their main role is to follow the project as interested parties.

The End Users Group (EUG) are the "hands-on" users of the products delivered by the project. EUG members consists of nuclear power plant operators and research reactor owners, as radioactive waste producers (RWP) and waste management organisations (WMOs). The EUG members benefit from a closer access to the project, having the opportunity to provide insight about their needs and challenges, as well as feedback on project outcomes.

PREDIS actively encourages to sing up as a stakeholder or end-user through a web link on the PREDIS website [2].

1.3 End User Group in Work Package 5

By June 2024 the End User Group has grown up to 25 members representing WMO's, operators, waste owners, waste producers and waste processing companies. Of these, 17 members expressed interest in the areas covered by WP5 (Table 1). The complete list of EUG members can be consulted on the PREDIS website [3].

In WP5, three of the 19 partners of the consortium are qualified as end-users: SOGIN, UJV and CEA. Furthermore, several partners have established links with their national end-users.

Table 1. EUG members interested in WP5 [3].

Country	Company	Role
Belgium	ENGIE SA	Operator
Belgium	NIRAS/ONDRAF	WMO
Bulgaria	SERAW	WMO
Czech Republic	SURAO	WMO
Finland	Posiva	WMO
France	Andra	WMO
France	ITER	Operator
Hungary	PURAM	WMO
Italy	Campoverde srl	Waste owner, producer
Netherlands	COVRA	WMO
Slovenia	ARAO	WMO
Sweden	SKB	WMO
Sweden	Studsvik	Waste owner
Sweden	SVAFO	Waste owner
Ukraine	Chornobyl NPP	Operator
United Kingdom	LLW Repository Ltd	WMO
United Kingdom	URENCO Ltd	Waste owner

2 EUG and Stakeholders engagement in WP5

As explained in the introduction of this report, engaging with stakeholders and end-users in PREDIS was a key priority. Common activities and practices were implemented at the project level, which helped to coordinate their engagement and avoid dispersed solicitations.

The following section outlines the activities carried out for one of the seven work packages to ensure stakeholder engagement.

Figure 1 illustrates what has been implemented by WP5 “Innovations in liquid organic waste treatment and conditioning”, to ensure the stakeholder engagement.

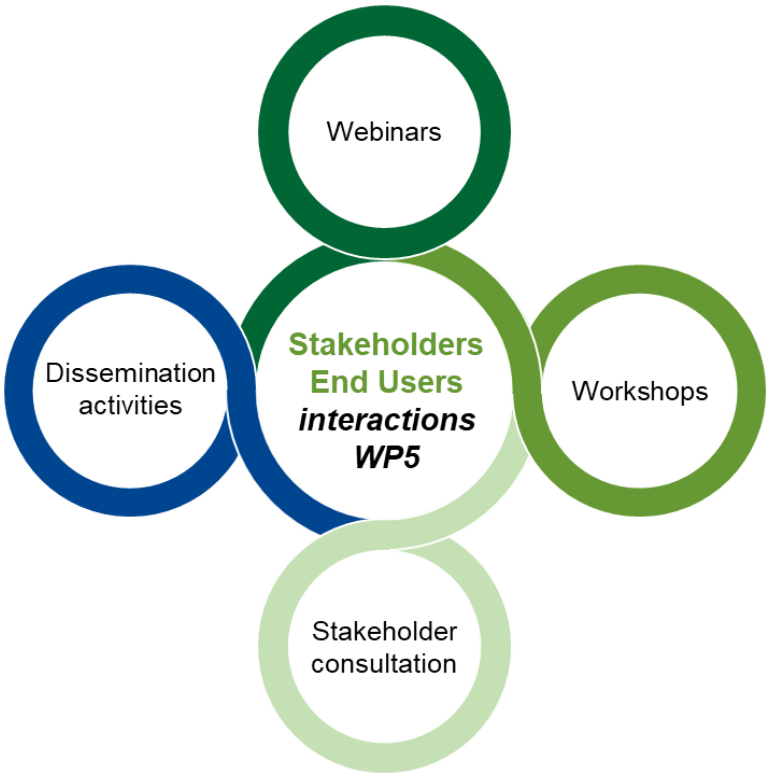

Figure 1. Framework for stakeholder and end-users interaction in WP5.

2.1 Webinars

PREDIS hosted 20 webinars, each focusing on a different topic within the project and other relevant work. Figure 2 provides an overview of the webinars in which Work Package 5 actively participated.

Webinar March 30th 2021	Webinar October 5th 2021	Webinar October 26th 2021
Innovations in liquid organic waste treatment and conditioning	PREDIS metallic and organic waste characterization	Geopolymers in Radioactive Waste Management
WP5	**WP2, WP4 – WP7**	**WP2, WP4 – WP6**

Figure 2. Overview of Work Package 5 involvement in PREDIS webinars.

The webinars' target audiences were the stakeholders, the end-user group and PREDIS partners. The participation of WP5 in these events provided an opportunity to interact and establish engagement with all of them.

Figure 3 provides the distribution of participants per group (stakeholders, end-users and PREDIS partner) who registered in each webinar. As it can be seen, in all of the webinars more than 35% of them are represented by the stakeholders and end-users.

Further details, including the presentations, a summary and the webinar videos are accessible on the PREDIS website [4].

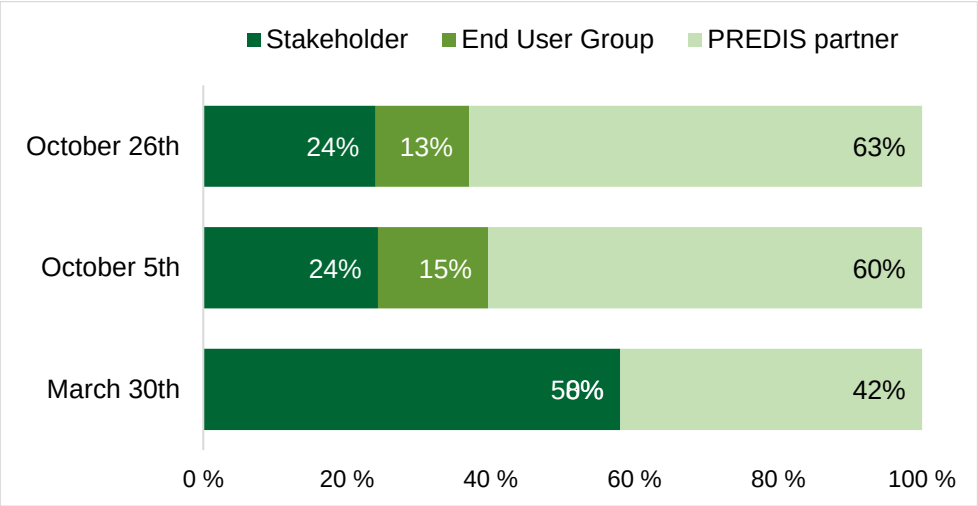

Figure 3. Representation of registered participants.[1]

2.1.1 Webinar March 30th 2021: Innovations in liquid organic waste treatment and conditioning

The online technical webinar held on 30th March 2021, focused on the objectives of WP5. It represented an essential element to gather information on the needs and challenges faced by waste owners with respect to Radioactive Liquid Organic Waste (RLOW), future objectives in RLOW management and the gaps that need to be addressed to meet these objectives.

The webinar consisted of four sessions, comprising of ten flash talks given by WP5 partners and also by stakeholders and EUG members, such as Andra, Ondraf/Niras, Orano, Urenco and IAEA. Following the formal presentations, small group discussions were held and live-polling was conducted to facilitate interaction between the stakeholders, end-users and PREDIS partners (Table 2).

Table 2 Live-poll questions and key results.

Live-poll	Key results
Why did you register for this webinar?	60% of the attendees participated in the webinar to increase the general knowledge.
What is the biggest challenge in the predisposal management of liquid organic waste?	47% of the participants identified conditioning as the biggest challenge in the predisposal management of RLOW.
What should be the primary focus of near-term R&D related to liquid organic waste treatment and conditioning?	48% of participants agree that legacy wastes should be the primary focus of near-term R&D related to liquid organic waste treatment and conditioning.

A total of over 200 participants from 25 countries registered to attend. With a participation rate of 62% (124 out of 200) and a retention rate of 57% (70 out of 124), the event demonstrated a high level of engagement and retention [5].

[1] The 58% of registered participants in the webinar March 30 2021 includes both stakeholders and end-users.

2.1.2 Webinar October 5th 2021: PREDIS metallic and organic waste characterization

This informational webinar on radioactive waste characterization hosted by the PREDIS project on 5 October 2021, aimed at reviewing the state of the art, presenting innovative solutions under investigation and discussing the links of the PREDIS project with characterisation methods, techniques, strategies and developments.

During the webinar, Work Package 2 (WP2) and all technical work packages (WP4, WP5, WP6 and WP7) were covered. WP5 presented how characterisation methods were planed to be used to assess the performance (e.g., leaching behaviour, radiation and thermal stability) of promising geopolymer matrices. In addition to the partners from the PREDIS projects, other interventions were undertaken by SCK CEN (CHANCE project), CAEN (MICADO project), CEA (TOMography In Situ), AiNT (QUANTOM project) and Scannix (SYSCADE system). Formal presentations were followed by small group discussions and live-polling to encourage interaction between the stakeholders, end-users and PREDIS partners.

The live-poll showed that 69% of the participants attended the webinar to increase their general knowledge. In total, more than 120 participants registered and the participation rate was 89% (106 out of 120) [6].

2.1.3 Webinar October 26th 2021: Geopolymers in Radioactive Waste Management

Informative webinar hosted by the PREDIS project on 26 October 2021, focusing on geoplymers, with the aim of reviewing the state of the art, presenting different applications, standards across sectors and discussing links with the PREDIS project.

During the webinar there were presentations from WP2, WP4, WP5 and WP6. As the work in WP5 focuses on geopolymers, specific objectives and expected impacts were presented during this webinar. In addition to the PREDIS partners, other interventions related to the use of geoplymers were presented by LMDC and KU Leuven.

Following the formal presentations, small group discussions and live-polling were conducted to gather perspectives and encourage interaction among stakeholders, end-users and PREDIS partners. The live poll showed that 56% of the participants attended the webinar to increase their general knowledge. In total, more than 130 participants registered, with a participation rate of 76% (99 out of 130) [7].

2.2 Workshops

2.2.1 PREDIS Annual Workshop

PREDIS organised annual workshop meetings aimed not only at consortium partners, stakeholders and EUG, but also at a wider audience of actors interested in the PREDIS topics. These workshops were hosted by the consortium partners in online, Espoo, Mechelen and Avignon (Figure 4). It allowed presentation of the progress of the R&D activities in WP5 and also to enable the dialogue and engagement with the whole audience, by:

- A dedicated session on WP5 aimed at the consortium partners involved, but also open to EUG if they were interested in attending.
- A WP5 technical session open to the public to present the results and general overall overview of the project, with some time for Q&A discussion from the audience.
- Panel discussion with representatives of EUG organizations.

4 - 6 May 2021	25 – 27 April 2022
• Day 2: WP5 innovations in liquid organic waste treatment and conditioning session. • Day 3: Chief achievements WP5 and EUG presentation.	• Day 2: WP5 innovations in liquid organic waste treatment and conditioning session. • Day 3: Status update and scientific presentation WP5 and Panel discussion from EUG/ stakeholders.
Online [8]	**Espoo, Finland** [9]

22 – 25 May 2023	3 – 7 June 2024
• Day 3: WP5 innovations in liquid organic waste treatment and conditioning session. • Day 4: Status update and scientific presentation WP5 and Panel discussion from EUG/ stakeholders.	• Day 3: WP5 innovations in liquid organic waste treatment and conditioning session • Day 4: Geopolymers for waste immobilization partner and end -user view.
Mechelen, Belgium [10]	**Avignon, France** [11]

Figure 4. Overview of the interactions of WP5 in the annual PREDIS workshops.

Further information such as the proceedings, agenda and presentations can be found on the PREDIS website [4].

In terms of stakeholder involvement, the attendance of stakeholders and EUG at each workshop shows a continuous interest maintained throughout the 4 years of the project. This was also demonstrated by the high attendance to the PREDIS final conference, where 173 participants registered (85% consortium partners and 15% stakeholders and end-users).

2.3 Stakeholder consultation

During the project, direct consultation with end-users[2] was carried out to obtain their feedback on specific issues, such as their priority research and development topics in WP5, the Radioactive Liquid Organic Waste (RLOW) inventory and data input for the disposability assessment and value assessment.

2.3.1 EUG on-line feedback survey

This survey was used to gather input on industry priorities to address challenges and opportunities for improved pre-disposal waste management. The questions focused on several aspects of the direction of the technical work packages of the PREDIS project. Detailed information on the content of the survey conducted can be found in Deliverable 2.1 [12].

In particular, for WP5 the participants were asked to answer the questions described in Table 3.

[2] Specifically for this section of the report (2.3 “Consultation and feedback”), when referring to end-users, both “external” end-users (defined in 1.2 and 1.3 of this report) and “internal” end-users referring to WP5 partners qualified as end-users (defined in 1.3 of this report) are included.

Table 3. EUG online feedback survey questions for WP5 [13].

WP5 Questions	WP5 Gap results
• What are the primary interests [volume reduction, cost savings, development of treatment and disposal routes for currently untreated wastes, minimising higher level clearance materials and/or other] of your organisation related to liquid organic waste treatment? • Are there any challenges/needs your organisation would like specifically to be addressed in this Work Package or any specific topics/ideas/gaps that were missed? • What methods, processes, technologies and/or demonstrations would be most useful for your organisation from this Work Package? • Does your organisation have any radioactive liquid organic wastes that could benefit from direct conditioning in a geopolymer-type matrix? • Is your organisation facing waste acceptance criteria issues for liquid organic wastes or geopolymers containing liquid organics?	A total of 29 unique topics/issues that met the definition for gaps of interest were associated with WP5 on liquid organic waste. Of these, 18 were categorised as already in-scope,0 as not in-scope, but could be, 10 as not in-scope and cannot be but could be promoted to the SRA, and 1 as being not in-scope and should not be. The assessment of the identified gaps highlights that, in order to increase interest in the use of geopolymers and related alkali-activated materials for the direct conditioning of radioactive liquid organic waste, PREDIS must seek to demonstrate that it is: • a feasible technical solution, without risks, • applicable to the diversity of liquid organic waste streams, • sustainable both economically and in terms of security of supply, • and that the matrix produced has sufficient properties, performance and safety to be disposable.

The detailed results of the survey for WP5 and the other work packages are presented in the Deliverable 2.2 Gap Analysis [13].

2.3.2 Detailed EUG Inventory Survey

During the first year of the project, an inventory questionnaire was carried out to collect information on metallic waste, liquid organic waste and solid organic waste from end-users and PREDIS partners. Appendix 3 of Deliverable 2.1 [12] presents the detailed content of the survey.

Specifically for WP5, the questionnaire allowed the identification of the main types of RLOW that have already been generated and some that will arise from future operations and decommissioning activities. Deliverable 5.1 “Input data synthesis results” [14] summarises the responses received and provides an insight into the dominant types of RLOW that need to be managed.

The results of this inventory and subsequent discussion among the WP5 partners, facilitate the selection of priority waste streams for further consideration in the research and development activities of WP5, as described in Milestone 30 [15].

2.3.3 WP5 Value Assessment Workshop

In order to assess the disposal implications and to complete the technical, economic and environmental analysis of the direct conditioning route for RLOW studied in WP5 (Tasks T5.4.9 and T5.5), a data request form was sent to end-users and consortium partners in January 2024. The results obtained are presented in Deliverable 5.4, Annexe 1 [16].

Specific Value Assessment activities, including a workshop with research partners and end-users in February 2024, was carried out as part of Task T5.5. The summary of results, workshop agenda, list of participants and conclusions are presented in Deliverable 5.5 [17].

2.4 Dissemination activities

As part of the stakeholder and end-user engagement, non-interactive activities such as open access publications and participation in external events were used by WP5 to disseminate information on the use of geopolymer matrices for the immobilisation of radioactive liquid organic waste and also to disseminate key research results.

Deliverable 5.6 [18] provides a detailed description of the dissemination, public participation and awareness activities carried out by WP5 during the PREDIS project.

3 Conclusions

This report provides an insight into how Work Package 5 “Innovations in liquid organic waste treatment and conditioning” interacted with stakeholders, external and internal end-users during the PREDIS project. Since 2020 and throughout the project, various activities, such as webinar presentations, live polls, quantitative and qualitative surveys and workshops were conducted to enable stakeholder and end-user engagement, which was an essential mechanism to ensure the relevance of WP5 outputs.

The activities carried out at project level, with several work packages in scope, were key tools to facilitate strong interactions with stakeholders and end-users, allowing them to contribute with insights on the industry’s inventory and practices of pre-disposal waste management, and feedback on the project’s technical activities and direction for maximum impact of the research results generated by WP5, as outlined in the previous chapters[3].

Engaging with stakeholders and end-users is crucial to ensure that their needs and expectations are well understood, but it is not always easy to achieve, so WP5 undertook a project retrospective exercise to look back and reflect on what went well, what didn’t go so well, and what could be improved in future projects. This exercise allowed WP5 to identify some good practices based on the lessons and experiences of the PREDIS project to assess the strong interaction with stakeholders and end-users: involving them as early as possible, even from the proposal stage; using regular and open communication with them; actively involving them, seeking their input and their feedback whenever possible.

[3] Most of the publications referred to in this document are open to the public and can be consulted on the PREDIS website: https://predis-h2020.eu/

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