PREDIS

Deliverable 4.14
Report on interactions with stakeholders/end-users in metallic waste

31/07/2024 Final version

PUBLIC

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This project has received funding from the Euratom research and training programme 2019-2020 under grant agreement No 945098.

Project acronym PREDIS	Project title PRE-DISposal management of radioactive waste		Grant agreement No. 945098
Deliverable No. D4.14	Deliverable title Report on interactions with stakeholders/end-users in metallic waste		Version Final
Type Report	Dissemination level Public		Due date M47
Lead beneficiary IMT ATLANTIQUE			WP No. 4
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Abstract

This deliverable provides a summary of the Work Package 4 “Innovations in metallic material treatment and conditioning” on interactions with stakeholders and end users throughout the course of the PREDIS project.

It summarizes the different interactions between stakeholders engaged in waste management such as Waste Management Organisations (WMO) as well as utilities that produce important volumes of metallic waste of different types, activities, morphologies, etc. The interactions were basically exchange of raw materials as well as advises and pertinent literature. Examples of interactions are detailed.

Keywords

Stakeholders, end-users, engagement, raw materials supply

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Acknowledgement

This project has received funding from the Euratom research and training programme 2019-2020 under grant agreement No 945098.

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Executive summary

This document gives an overview of the stakeholders and end-users interactions that took place with Work Package WP4 “Innovations in metallic treatment and conditioning” partners in the PREDIS project. It is a non-exhaustive document but meant to summarise the activities and interactions between consortium partners and stakeholders/EUG. Their participation was right from the preparation of the PREDIS project and thought the 4 years of the project. They were valuable in providing data, advises as well as raw materials for the experimental programs.
The report describes the stakeholders/EUG engaged with WP4 and the interactions that occurred including webinars, workshops, and consultation and materials supply. Their participation in webinars and workshops was then described. The document presents examples of consultation and materials supply by EUG to the partners.

1 Introduction

The PREDIS (Pre-disposal 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].

For this aim, PREDIS implemented a stakeholder engagement strategy across the whole project, targeted to exchange, collaborate, disseminate information, and also to gather data from multiples stakeholders. Those actions open up channels with the End User Group (EUG) (WMOs, waste owners, generators and regulators) that contributed with valuable input that allowed to verify that task within the work packages addressed the correct needs and criteria in the R&D activities.

1.1 Framework of the Stakeholder engagement within PREDIS

Stakeholder engagement within PREDIS project has been a continuous process, a broader range of activities have been implemented since 2020 between PREDIS partners and those potentially impacted or interested in the project, a wide spectrum of activities for consultation, dissemination of information and participation have been implemented in PREDIS. Commonly those activities become a one-time set interaction during the planning phase of a project and rarely extend beyond it, however PREDIS project implement those activities during the entire life of the project.

1.2 Difference between Stakeholders and the End User Group

Stakeholders' community in PREDIS are all national organisations, international organisations, and individual who might have an interest in pre-disposal, who are directly or indirectly affected by the project and who may have the ability to influence the project outcomes. Stakeholders includes regulators, research groups, universities, supply chain companies, civil society, among others, their main role is to follow the project as an interested party.

The End Users Group (EUG) consists of nuclear power plant operators and research reactor owners as radioactive waste producers (RWP) and waste management organisations (WMOs). EUG members benefit from project involvement by having closer access to the project innovative tasks, having opportunities to provide insights about their needs and challenges, and providing feedback on draft plans for technology developments and implementation of project outcomes. A diverse and active EUG ensures high impact of the Project.

PREDIS actively encourage to sign up as a stakeholder or EUG through a web link on the PREDIS website (https://predis-h2020.eu/end-user-group/).

1.3 End User Group in work package 4

By June 2024 the End User Group includes 25 members representing WMO's, operators, waste owners, waste producers and waste processing companies, from which 20 members are interested in the areas of WP4 (Table 1). The complete list of EUG can be consulted in PREDIS Website [2]. It is interesting to highlight the presence of organisations from non EU countries (UK, USA, Switzerland and Ukraine).

Among the 22 consortium members of WP4, 5 of them can be considered as end-users since they are waste producers. They are Orano, Enresa, Nucleco, CEA and SCK.CEN. They are directly contributing to the project through experimental wok, as well as into webinars and workshops, materials supply, data sharing, etc.

Originally, the WP4 was drafted by EDF (France) known as a major producer of metallic waste such as stainless steel and Ni-Alloys. Nevertheless, EDF remained connected to the project as an end-user but contributed well by providing raw materials and by sharing advises, recommendations and literature.

WP4 did not establish a formal procedure to interact with EUG. The consortium members relied on their staff members to connect and involve EUG on a voluntary basis. Consortium partners have developed close partnership with EUG through national and European projects and initiatives in the domain of education & training as well as in the research & development.

Table 1. EUG members interested in WP4 [2]

Country	Company	Role
Belgium	ENGIE SA	Operator
Belgium	NIRAS/ONDRAF	WMO
Bulgaria	SERAW	WMO
Czech Republic	SURAO	WMO
Finland	Fortum	Operator
Finland	Posiva	WMO
France	Andra	WMO
France	EDF	Operator
France	ITER	Operator
France	NAAREA	WMO
Italy	Campoverde srl	Waste owner, producer
Slovenia	ARAO	WMO
Sweden	SKB	WMO
Sweden	Studsvik	Waste owner
Sweden	SVAFO	Waste owner
Switzerland	Nagra	WMO
Ukraine	Chornobyl NPP	Operator
United Kingdom	LLW Repository Ltd	WMO
United Kingdom	URENCO Ltd	Waste owner
United States	Idaho National Lab	Operator

2 EUG and Stakeholders engagement in WP4

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

Figure 1 shows the major interactions that occurred between WP4 members and stakeholders/EUG. The EUG members were systematically invited to webinars and workshops. They contributed by several lectures in webinars and participated to panels during different workshops. Whenever needed discussions were initiated with stakeholders for technical advice or for raw materials supply.

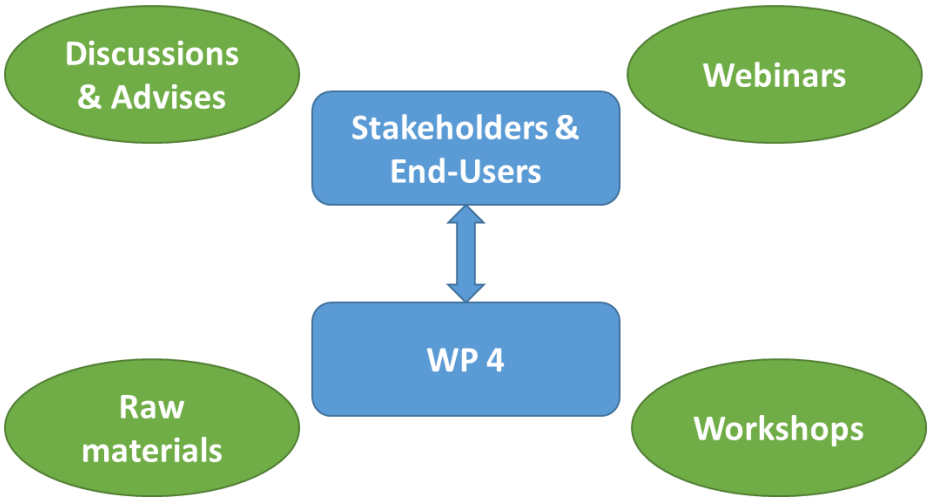

Figure 1. Framework for stakeholder and end users interaction with WP4

2.1 Webinars

PREDIS organised 20 webinars, each focusing on a different topic within the project and other relevant work. The webinars where WP4 was involved as organiser or contributor.

Webinar February 16th 2021	Webinar October 5th 2021	Webinar October 26th 2021	Webinar February 14th 2024
Innovations in Metallic Waste Treatment and Conditioning	PREDIS metallic and organic waste characterization	Geopolymers in Radioactive Waste Management	Difficult To Measure (DTM) Radionuclides: progress and new challenges
WP4	**WP2, WP4 – WP7**	**WP2, WP4 - WP6**	**WP4**

Figure 2. Overview of Work Package 4 involvement in PREDIS webinars.

Work package 4 was involved in motivating its network of stakeholders and end-users for participation to the webinars as audience but also as lecturers. Especially it is important to highlight the organisation of discussion rooms with the participation of end-users to allow a close discussion of practical industrial issues for a particular subject (characterization, decontamination, recycling, etc.). Typically, about 120 to 150 participants were registered to the webinars with an average participation of stakeholders and end-users of 30%.

More information, such as the presentations, a summary and the webinar videos can be found in the PREDIS web site: https://predis-h2020.eu/events/

2.1.1 Webinar February 16th 2021: Innovations in metallic waste treatment and conditioning

The first technical webinar of WP4 was organised online on February 16th 2021. The webinar gathered a balanced representation of consortium partners and stakeholders. It consisted of 3 hours long four sections:
Section 1. Overview on metallic waste management and characterization with lectures done by stakeholders/end-users (ENRESA, Spain; UNS, UK; EDF, France)

Section 2. Selected subjects: decontamination activities in NPP (NEK NPP, Slovenia); development of magnesium phosphate cement as host matrix for metallic waste (CEA, France).

Section 3. Breakout Room Sessions to promote interactions between the stakeholders, end users and PREDIS partners, where four rooms were constituted randomly and discussions, were held with typical questions such as “What are the management strategies for metallic waste?”, “What are the R&D and technical needs for characterization & decontamination and confinement?” or “What are the innovation roots to decrease the metallic waste future inventories?”

Section 4. Conclusions. Feedback from the discussions highlighted the needs for developing new methods for material characterisation in particular those contaminate with alpha emitters. Also, recycling was acclaimed by many participants, who highlighted the high quality of the organisation, the presentations and subjects proposed.

Following the webinar a questionnaire was distributed among the participants, with typical questions on the quality of the sessions, helped getting feedback from stakeholders and end-users (Surao, Andra, UNS, ININ, TECNALIA, etc.). Overall the rating was very good in terms of the quality of the technical presentations and their contents. Nevertheless, they advised the organisers to allow more time dedicated to discussions. Similar feedback was obtained from the consortium partners.

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

This informational webinar on Radioactive Waste Characterization hosted by PREDIS project on October 5 2021, had the aim to review the state of the art, present innovative solutions under studied and discus connections of PREDIS project with characterisation methods, techniques, strategies and developments.

During the webinar interventions from WP2 and all technical work packages (WP4, WP5, WP6 and WP7) were held. Work Package 4 presented the variety of materials used in the studies, including metallic materials (stainless steel, Ni-Alloy, etc.) and conditioning materials (cement) and the characterization techniques (simulation, gamma, beta, alpha spectrometry, XRD, FTIR, NMR, etc.). In addition to partners from PREDIS projects, other presentations were given by SCK.CEN (CHANCE project), CAEN (MICADO project), CEA (TOMography In Situ), AiNT (QUANTOM project) and Scannix (SYSCADE system). Following the formal presentations small groups’ discussions were

held and live-polling was conducted to promote interactions between the stakeholders, end-users and PREDIS partners.

Live-poll showed that 69% of the attendees participated to the webinar to increase their general knowledge. In total more than 120 participants registered to attend, and had a participation rate of 89% (106 out of 120).

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

The webinar hosted by PREDIS project on October 26 2021, focused on geoplymers and their application in radioactive waste management. With the aim of reviewing the state of the art, present different applications, standards across sectors and discus connections with PREDIS project.

Following a nice introduction on geopolymers by CEA (WP5), presentations were given on geopolymers involvement in WP2-WP6. Hence, WP4 presentation covered the studies of geopolymers stability under gamma irradiation that are hold at IMT Atlantique and POLIMI. Little or not detected radiation-effect were noticed.

Following the formal presentations small groups' discussions were held and live-polling was conducted to gather perspectives and promote interactions between the stakeholders, end-users and PREDIS partners. Live-poll show that 56% of the attendees participated to the webinar to increase the general knowledge. In total more than 130 participants registered, with a participation rate of 76% (99 out of 130).

2.1.4 Webinar February 14th 2024: Difficult To Measure (DTM) Radionuclides: Progress and new challenges

The webinar hosted by PREDIS project on February 14 2024, focused on the progress and new challenges on the measurement of DTM radionuclides. Interesting lectures were given by consortium members as well as end-user members. Subject covered the radiochemical methodologies developed for DTM measurement (sampling, matrix treatment, extraction, purification, detection, validation). Discussions about future challenges were held and included target development, optimization and harmonization of innovative techniques for characterizing the radiological, physical, and chemical properties of LLW/ILW mixed waste.

Participation was very important with an average 130 attendees, among them 30% stakeholders, 35% end-users and 35% consortium members. This highlights the importance of the DTM subjects to the nuclear community. Among the end-users we can cite Vattenfall, Tractebel, Engie, Belgoprocess, Enresa, Westinghouse, etc.

2.2 Workshops

2.2.1 PREDIS Annual Workshop

The contribution of the stakeholders and end-users has been of great interest from the birth of Predis and took place in many events such as the annual workshops. For instance, during the annual meeting organized in Finland on April 25-28, 2022, the WP 4-7 sessions were opened to EUG members to contribute into the general discussions with emphasis on the needs of EUG as well as those of the consortium partners (advise, raw materials, technology, etc.). Three different sessions were held: (1) EUG with WPs 5-6, (2) EUG with WP4 and (3) EUG with WP7. The discussions were then continued during dinner with EUG/Stakeholders and consortium partners. The next day the

EUG/Stakeholders exchanged with the consortium partners: (1) WP1: Overview of project, (2) WP2: Information and discussion on how the stakeholder community can influence the future Strategic Research Agenda, and (3) WP3: Information about plans for training and guidance activities, where stakeholder involvement is welcome. Finally, the EUG members were invited to participate to an excursion to the Materials Underground Research hall, or to FiR1 Triga Research reactor decommissioning site or to the Bioruukki Facility for waste reduction by thermal treatment and waste characterization.

The PREDIS Annual meeting held in Mechelen (Belgium) on May 2023 offered a nice opportunity for stakeholder/EUG and partners interactions with a whole day session (25/5/2023). The day started with status updates and scientific presentations on technical Work Packages WP4-7. A session involved WP4 students who presented their thesis work with two different subjects: (1) Aluminium corrosion in different cement systems to assess the hydrogen inhibition and (2) Optimization of effluent decontamination. Then, a guided panel discussion of Belgium stakeholders was held in the presence of the major actors in the nuclear sector in Belgium: ONDRAF-NIRAS (WMO), Federal Agency for Nuclear Control – FANC (regulator), ENGIE (industry), Magics Technologies (industry) and FOD Economie (government). The panellists presented their activities and shared their experience and future needs in particular in terms of R&D.

The participation of stakeholder/EUG at the final PREDIS conference on 3-7 June 2024 was very important. The last two days (5-6 June) were open to Public including stakeholders/EUG. On June 5th technical workshop with selected subjects from WP 4-7 including presentations done by PhD students was organised with the participation of stakeholders/EUG. On June 6th a session on project outcomes and impact workshop was organised with presentation from EUG members (Enresa, Orano, Andra). The feedback was very interesting from all participants including stakeholders/EUG. The participants appreciated the technical sessions, the good atmosphere and sense of achievement, and the technical tour offered by CEA.

2.3 Consultation and Materials supply

The interactions between consortium partners and stakeholders/EUG were continuous throughout the project next to those during webinars and workshops. Non-exhaustive examples can be seen in Figure 3.

	Raw materials supply
EUG 1 - EDF	1. Supply of Inconel 600 for chemical decontamination experiments (Task 4.4). The Ni alloy was oxidized using the method developed by SORC (Hungary) and then transferred to IMT Atlantique for decontamination studies by A. Rivonkar (PhD). 2. Supply of fly ash for MKP preparation (Task 4.6). An agreement between EDF and IMT Atlantique was signed to provide fly ash, which was then distributed among consortium partners of Task 4.6. The fly ash was used in preparation of reference Magnesium Phosphate Cement, which was proven to be of high quality (good mechanical, physical and chemical properties). This reference cement was used for comparison with new cement formulation intending to replace the fly ash by other filler such as wollastonite, volcanic ash or slag furnace. The chemical, physical and mechanical properties of the new formulations can be compared to those of fly ash based.

EUG2 - Triskem	1. Supply of resin for DTM analysis measurements (Task 4.5). The resins were used to separate zirconium from decontamination effluents for analysis by ICP-MS and LSC. Purification in mandatory to be able to detect and measure Zr at ultra-trace level.

	Advises, procedures, protocols
EUG 1 - EDF	1. Advises for selection of chemical decontamination techniques within the framework of A. Rivonkar's PhD work. In fact, a research engineer from EDF participated to the PhD annual committee that reviews the annual wok progress and re-orient the subject if necessary. We benefited a lot from these meetings where we worked on the clear needs of EDF (and industry in general) and how the PhD can help to address these needs. 2. Beside a SoTA on nuclear decontamination, interaction with EDF helped us to focus on two techniques, which seem to be more promising. 3. Also, supply of literature was another interesting and advantageous side of the interaction with EDF.
EUG 2 - ENRESA	1. Advises on requirements for Al corrosion and immobilization 2. Discussions of results of Al corrosion and coordination of activities
EUG 3 - Triskem	1. Supply of protocols for the use of resins for DTM analysis measurements. 2. Participation to PhD committee of M.n Robin, which evaluates the progress of work once per year. The input from Triskem in terms of experimental conditions (chemistry, pH, temperature) was highly valuable to advancing the PhD work.

Figure 3. Examples of interactions between partners and stakeholders/EUG.

3 Conclusions

Interactions of consortium partners with the stakeholders/EUG were very much appreciated starting with valuable discussions from the preparation period of the project. Consultations and discussions were held throughout the project during the webinars and workshops but also whenever it was necessary. The contacts were facilitated by existing partnerships between partners and stakeholders/EUG in the framework of national or European projects. Valuable discussions and advises helped moving forward efficiently while saving time and money. Supply of raw materials was highly appreciated and allowed developing our experimental programs. Nevertheless, we wished more interactions with stakeholders/EUG but we understand that they have to make effort to free time and contribute into our project.

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