

INSIDER PROJECT FOLLOW-UP

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INTRODUCTION

Actual challenges to be considered for waste management


- **Drastic waste minimisation (disposal site)**
- **Sharing knowledge**
- **Common methodology establishment at European level**
- **Industrial implementation**

Main results and achievements

Project strengths and assets:

- Acting on the upstream phase, on contaminated materials
- Waste led approach
- Common methodology development and refinement on real D&D cases (benchmarking)
- Multidisciplinary consortium

Main achievements :

- **Initial Characterisation** methodology for constrained environments
- Selection of **suitable measurement techniques** depending on constraint types 
- In lab analysis methods availability- **Innovative development needs and contribution**
- **Matrix (C)RM** production
- **Uncertainty budget & global performance** assessment approaches
- International standard mapping and **pre-standard guide propositions**

- Other D&D characterisation steps
 - Low level activities
 - Chemical toxics
- Application on legacy wastes, NORM,...
- Suitable measurement techniques and methods
- Interface with digital tools

Horizon Europe & EURATOM context

Radioactive waste management and decommissioning

- **2021-2024** European Joint programme on radioactive Waste management EURAD
- **2021-2022:** Research action for harmonised application of the regulatory framework of radioactive waste management

Overview of the main indirect actions in the Euratom Research and Training Programme 2021-2025 ¹⁶			
Research areas	2021-22 Work Programme	2023-24 Work Programme	2025 Work Programme
Radioactive waste and spent fuel management <i>(20% of the fission budget)</i>	Research actions supplementing EURAD European Joint Programme	<u>Co-funded European Partnership in radioactive waste management</u>	
		Supplementary research in areas not covered by the European Partnership in radioactive waste management	

2022: Mid term EURAD review

SHARE roadmap

Euratom 2021-2022 Work programs

HORIZON-EURATOM-2021-NRT-01-08: Towards a harmonised application of the international regulatory framework in waste management and decommissioning

Scope: The objective of this action is to address benefits and advantages of providing solutions for obstacles to a common regulatory framework in waste management and decommissioning, providing a basis for improving harmonisation. This will support implementation of the requirements of a high level of nuclear safety and safe management of spent fuel and radioactive waste

→ Type of action : CSA

- Main outcomes
 - Deliver science and technology-based robust solution to minimise waste
 - Define the conditions and opportunity of a high-safety circular economy and operational know-how and its benchmarking
 - Foster the characterisation and sorting of disused materials
 - Facilitate the safe reuse and recycling of materials
 - Inventory and dissemination of MS strategies relying on the different steps... of operational minimisation of waste
 - Evaluate the regulatory implications of using advanced manufacturing technologies (robotics, additive manufacturing, digital twin...)

EURAD strategic research: theme 2 RW characterisation

- R&D priorities and activities of common interest:
 - Developing reliable and affordable technologies for the radiological characterisation and segregation of historical preconditioned waste (Medium)
 - Improved understanding of the nature and quantities of the likely chemotoxic component of common wastes (Medium)
 - Fourth generation wastes : nature and quantities of waste (Low)

EURAD joint programme roadmap

	Phase 0: Policy, Framework & Programme Establishment	Phase 1: Site Evaluation & Selection	Phase 2: Site Characterisation	Phase 3: Facility Construction	Phase 4: Facility Operation and Closure
Theme 2 Radioactive waste characterisation, processing and storage (Pre-disposal activities), and source term understanding for disposal Topic	Includes conceptual design and preliminary qualitative safety analyses <ul style="list-style-type: none"> Develop, and maintain national waste inventory (characterization, documentation of waste being produced and estimates for future arisings). Provide input to evaluation of disposal options (waste inventory for planning purposes and to scope preliminary design options and safety analyses). Develop guidance for waste treatment (preliminary waste acceptance criteria) for the different waste disposal routes. Where necessary, develop new waste treatment methods and input to the development of the corresponding waste treatment facilities. 	Includes preliminary site(s) design and generic safety case(s) / analyses <ul style="list-style-type: none"> Adjust waste treatment guidance (preliminary waste acceptance criteria) according to new findings, taking results from site evaluation into account (optimization for safety and other issues (incl. cost)). Refine radionuclide source term treatment and understanding of waste package performance to account for understanding of a prospective/ selected site. Provide inventory and source term understanding for construction license. Develop waste acceptance criteria for construction license. 	Includes detailed design and site safety case / analyses for construction license	Includes final design and site safety case / analyses for operational license <ul style="list-style-type: none"> Transform waste treatment guidance into draft waste acceptance criteria and adjust them according to detailed repository layout (optimization for safety and other issues (incl. cost)). Provide inventory and source term understanding for operational license. 	Includes maintenance and update of license documentation, as required <ul style="list-style-type: none"> Organize logistics (delivery of waste to repository) and enforce compliance of waste accepted for disposal with waste acceptance criteria in force Ensure compliance with safeguards Maintain national waste inventory and maintain detailed documentation on wastes emplaced in the repository Modify waste acceptance criteria when appropriate to take optimization for safety and other issues (incl. cost) into account. Provide detailed information (incl. documentation) for closure license.
Waste handling, characterisation, treatment and packaging	<ul style="list-style-type: none"> 1.2.4 Management of damaged waste packages H2020 Project DIGOO 3.7 Links between waste producers & implementers J1.1.3 Novel conditioning methods for problematic wastes. H2020 Project THERAMIN Waste management routes across Europe EJP1 WP ROUTES 	<ul style="list-style-type: none"> J1.1.7 Improved understanding of the nature and quantities of the likely chemotoxic component of common decommissioning wastes. M J1.1.2 Technology for characterisation & segregation of historical wastes. H2020 Projects CHANGE, INSIDER & THERAMIN M J1.1.8 Optimisation of novel waste treatment techniques. EJP1 Project SFC M 			
Interim storage	<ul style="list-style-type: none"> 3.10 Long-term storage for disused seals radioactive sources 2.4.6 Operational lifespan of interim storage 				
Transportation between facilities					
Radionuclide inventory and source term	<ul style="list-style-type: none"> 3.8 Methodologies applied to refine inventory 3.6 Inventory collation J1.1.1 Inventory data and uncertainty treatment. EJP1 WP SFC J1.1.10 Quantification of fissile content of spent fuels. L 	<ul style="list-style-type: none"> J1.2.2 Improved understanding of the performance of the final waste package (including the waste form) during prolonged storage prior to its transport and disposal. H J1.1.9 Improved understanding of radionuclide release from wasteforms other than spent fuel. H J1.1.4 Improved understanding of radionuclide release from spent fuel, inc. fire and impact. H2020 Project DIGOO & EJP1 WP SFC H J1.1.5 Demonstration of geopolymers performance in representative disposal conditions. M J1.1.6 Fourth generation (Gen-IV) wastes L 			
Waste acceptance criteria				<ul style="list-style-type: none"> 1.4.2 Improved understanding of the generation and release of radioactive trace gases and bulk gases from wasteforms and waste packages. H 2.1.8 Waste acceptance criteria M 	

- Improved understanding of the nature and quantities of likely chemotoxic components
- Technologies for legacy waste characterisation (INSIDER, CHANGE, THERAMIN)

Conclusion

To summarize:

- EURAD 2021-2022:
 - Extension of INSIDER developments (waste cartography)
 - To legacy waste
 - To chemical species
 - EURAD mid term review
- EURATOM 2021-2022 work programme
 - Complementary of EURAD
 - In relation to a common legatory framework
 - CSA
- 2023-2025 : SHARE Roadmap (2022)

THANK YOU



<https://igdtp.eu/activity/eurad-european-joint-programme-on-radioactive-waste-managment/>

<https://ec.europa.eu/info/funding-tenders/opportunities/>

<https://share-h2020.eu/>