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HARPERS - Conditions and Opportunities for Promoting Circular Economy Approaches in Nuclear Decommissioning and Radioactive Waste Management

HARPERS
HARMONISED PRACTICES, REGULATIONS AND STANDARDS IN WASTE MANAGEMENT AND DECOMMISSIONING

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Introduction

The 3-years Euratom HARPERS (HARmonised PracticEs, Regulations and Standards in waste management and decommissioning) project aims to establish and clarify the benefits and added value of a more aligned practices, methodologies and approaches for prioritised topics related to decommissioning and radioactive waste management between EC Member States. One of the technical themes included in the HARPERS project is focused on addressing the most important conditions and opportunities for promoting circular economy approaches.

Description of the research problem

It is recognized that the application of circular economy principles in nuclear decommissioning and radioactive waste management can lead to benefits such as minimizing waste, increasing resources efficiency or enhancing sustainability. Nevertheless, there are challenges ahead in implementing sustainability and circular economy approaches across Europe.

Based on a first identification of the main priority areas and a subsequent analysis of the existing challenges and well-established experiences, HARPERS project addressed the conditions and opportunities for promoting circular economy approaches when managing materials and waste arising from nuclear decommissioning across Europe.

Methodology

The first phase of the project was dedicated to the identification (through a deep stakeholder interaction) of priority areas for circular economy considerations. The priority topics included: (i) National regulations and criteria for clearance, (ii) Benchmarking of circular economy approaches and technologies, (iii) Sustainability assessment.

Those topics where further analysed in the second phase of the project to:

- identify the differences between national regulations, release criteria and methodological approaches, and their impact on the reuse and recycling of waste
- identify the advantages and weaknesses, as well as the points that could be balanced through greater cooperation and/or recommending good practice for wider use
- collect and analyse actual examples and case studies (in and outside the nuclear field) outlining implementation of Circular Economy approaches and technologies to the decommissioning of nuclear facilities and related radioactive waste and materials management
- set up a robust decision support framework that enables the comparison between linear and circular economy approaches in radioactive waste management and decommissioning

All the collected data and outcomes have been summarised in a Position Paper on circular economy considerations.

Results

The conducted analysis showed that integrating circular economy principles into nuclear decommissioning and radioactive waste management can result in significant **benefits**:

- reducing consumption of raw materials,
- decrease of the amount of radioactive and non-radioactive wastes (by reusing and recycling as much as possible),
- optimising the use of available resources by repurposing of facilities and/or sites,
- lowering cost and environmental impacts,
- decommissioning process innovation.

Some already well implemented practices exist, but there are still several significant **challenges** to integrate circular economy principles in current and future decommissioning and waste management projects.

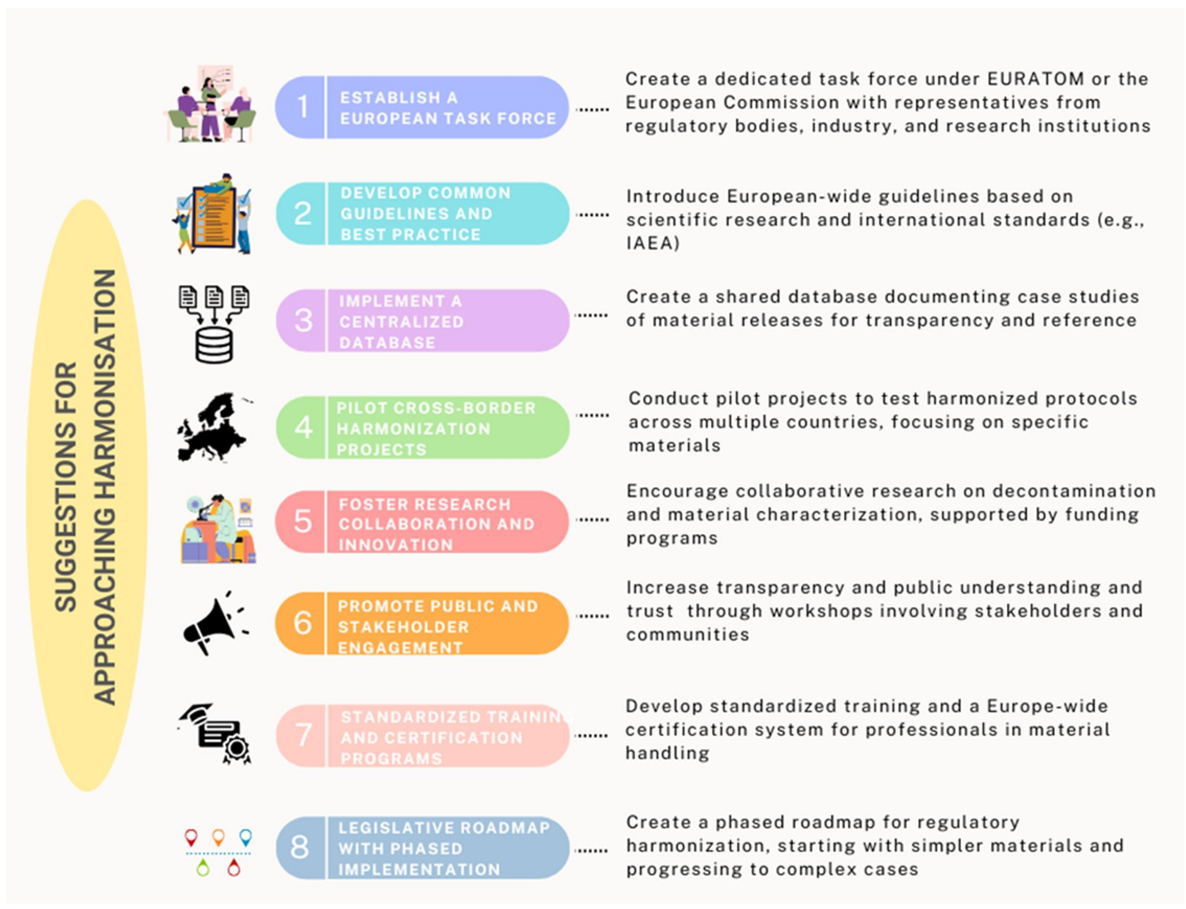
- Technical: limited capacity of existing technologies to decontaminate and detect slightly contaminated radioactive materials, which restricts their recyclability and reuse.
- Regulatory: differences in national regulations create ambiguity in the application of clearance levels, and treatment of the different material streams, leading to inconsistencies that may impact public acceptance and trust in radioactive materials management practices.
- Social: public perception about recycling of radioactive materials remains a significant barrier.

To address these challenges, it is essential to implement innovative solutions, promote and support ongoing research and development, and develop a robust evaluation framework that includes clearly defined and measurable criteria to assess the overall benefits of various strategies.

Conclusions

Regulatory constraints can complicate the establishment of a harmonised approach to radioactive waste and materials management across Europe. Clearance levels and conditions for recycling often vary, creating barriers to cooperation. The public remains sceptical about the recycling of radioactive materials, necessitating improved stakeholder engagement and dialog to build trust.

Some **suggestions** have been identified for approaching harmonization at European level to facilitate the transition towards a (more) circular approach to nuclear decommissioning and radioactive waste management.



By addressing regulatory challenges and fostering collaboration among stakeholders, the nuclear industry can transition towards a more resource-efficient and sustainable future.

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