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SNETP Forum

HARPERS WP4.2C – GUIDELINES FOR COMPARING CIRCULAR AND LINEAR ECONOMY APPROACHES TO NUCLEAR DECOMMISSIONING

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

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Introduction

The 3-year Euratom HARPERS project aims to clarify the benefits of harmonized practices, methodologies, and approaches in decommissioning and radioactive waste management across EC Member States. Work Package 4 focuses on identifying key conditions and opportunities to promote circular economy approaches in decommissioning and waste management. Building upon the outcomes of Phase 1 of the project, WP4 Subtask 4.2c “Sustainability Assessment” established a framework to compare linear with circular economy approaches to nuclear decommissioning (ND) and radioactive waste management (RWM).

Description of the research problem

The lack of a standardized framework for comparing linear and circular economy approaches in ND and RWM creates inconsistencies across European countries. Without clear criteria (I&Cs), decision-making remains fragmented, limiting transparency and comparability. Our research addresses this gap by developing a Multi-Criteria Analysis framework, incorporating expert input through a Delphi study to establish a consensus-driven set of I&C for more sustainable and harmonized ND and RWM practices.

Methodology

The framework applies MCA to compare alternatives across multiple dimensions, incorporating stakeholder perspectives. To define *Circular economy* in ND and RWM, and establish I&Cs for MCA, a Delphi study was conducted. This structured, iterative method gathers expert input, refines responses, and builds consensus. The results were further discussed in stakeholder workshops to ensure broad representation and validation.

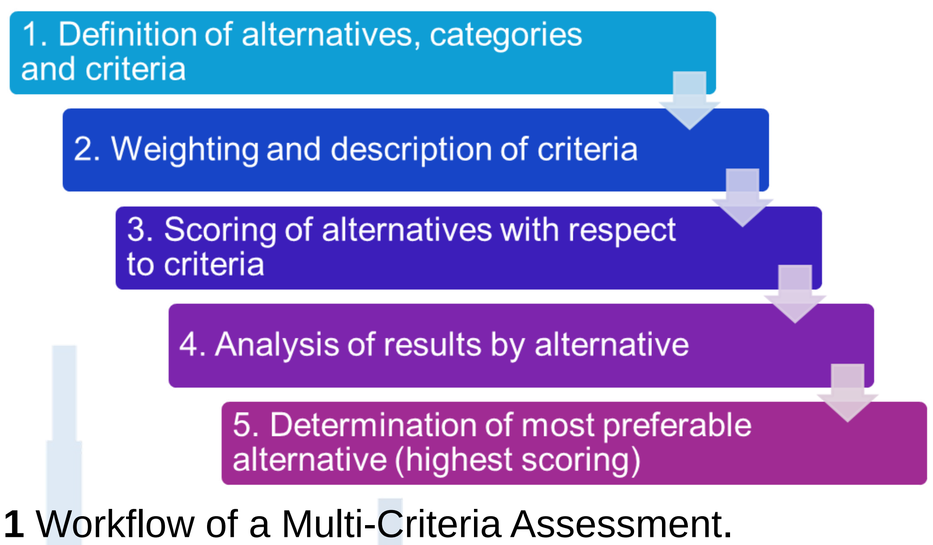

Figure 1 Workflow of a Multi-Criteria Assessment.

Results

The study led to the identification of 29 criteria, grouped into 5 categories, to compare linear and circular economy approaches in ND and RWM. These I&Cs were categorized into *Environmental*, *Social*, *Health&Safety*, *Techno-economical* and *Legal* dimensions, forming the basis for an MCA framework. A practical MCA case study conducted in France on radioactive waste management provided further insights into the applicability of the framework, helping refine its relevance to real-world decision-making.

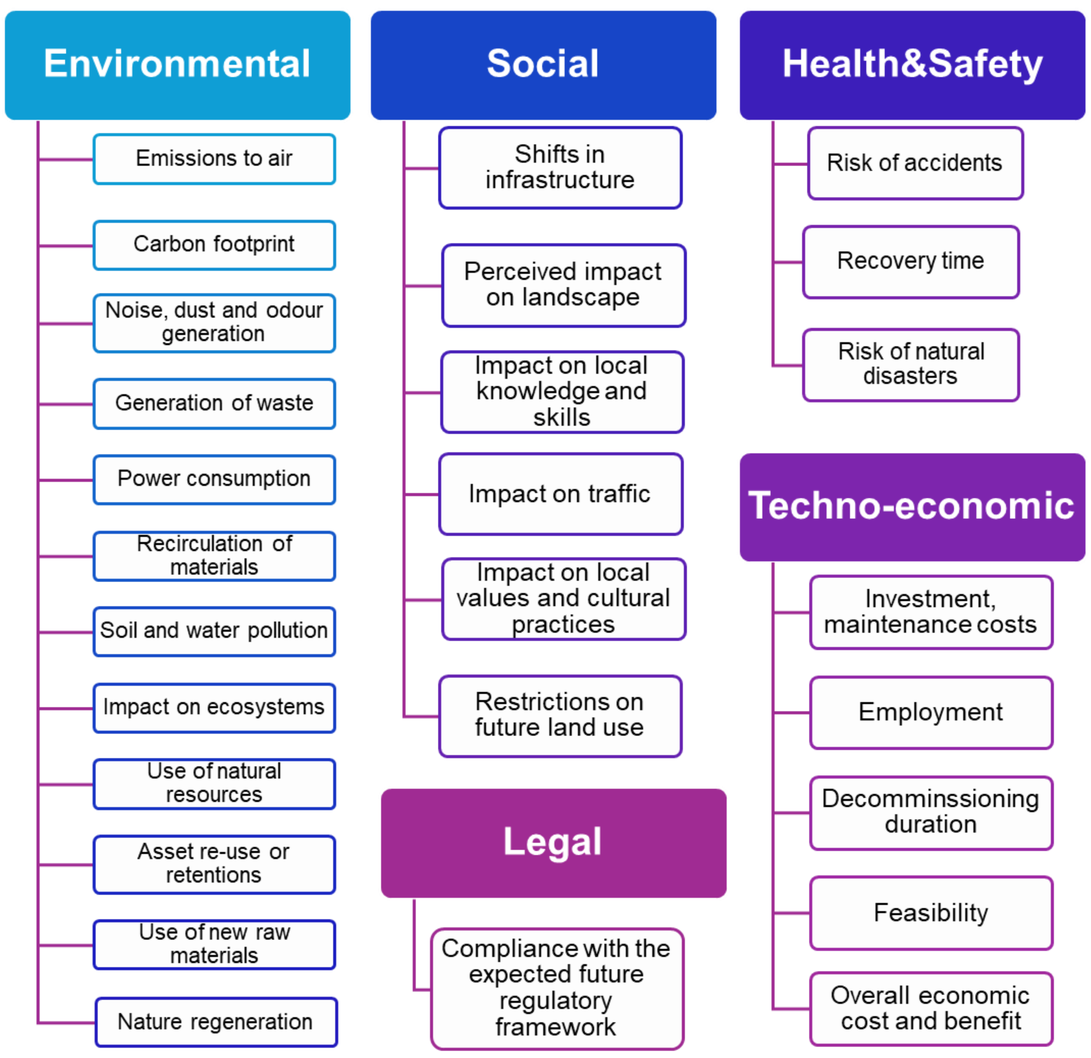

Figure 2 Final set of categories and criteria proposed by the working group, after 2 Delphi study iterations.

Conclusions

The findings of our study highlight the importance of a standardized yet flexible approach to evaluating ND and RWM strategies, balancing the five categories. The proposed I&Cs offer a structured foundation for decision-making, encouraging transparency and accountability across different case studies. While the framework is adaptable to specific national contexts, its implementation requires further validation through practical applications.

The lessons learned from the French case study demonstrate the potential of MCA in supporting sustainable and harmonized decommissioning practices across European Member States.

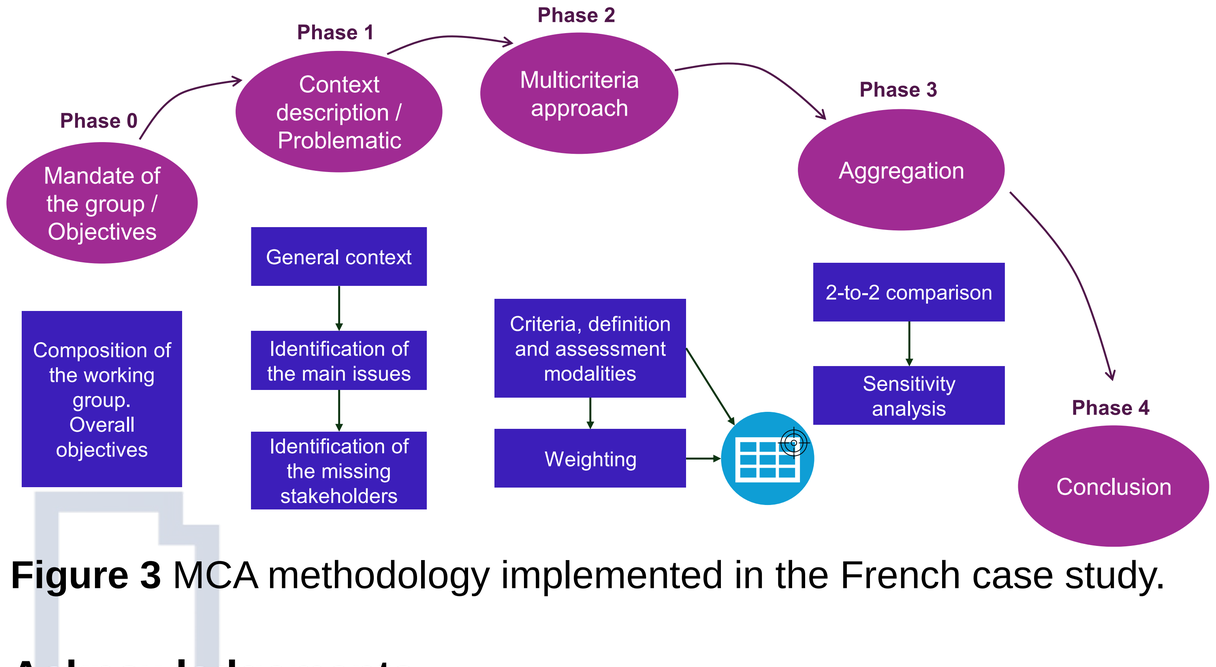

Figure 3 MCA methodology implemented in the French case study.

Acknowledgements

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