

Abstract

The AWARE project will develop an innovative Life Cycle Sustainability Assessment (LCSA) methodology tailored specifically to Water Resource Recovery and Reuse (WRR&R) systems, aiming to improve the robustness, consistency, and comparability of sustainability assessments in the water sector. The project will establish clear and harmonized methodological rules aligned with existing international standards, while introducing targeted guidance to address the specific characteristics of circular water systems. Through this approach, AWARE will deliver a solid, knowledge-based tool to support policymakers and stakeholders in planning and implementing effective and sustainable water management strategies.

The proposed method will integrate the three dimensions of sustainability - environmental, economic, and social - by combining Life Cycle Assessment (LCA), Life Cycle Costing (LCC), and Social Life Cycle Assessment (S-LCA). Particular emphasis will be placed on the collection of primary data through interviews and questionnaires to capture diverse stakeholder perspectives. The economic analysis will include cost-benefit assessments to clarify treatment costs and improve user acceptance of WRR&R solutions, while the social assessment will examine impacts and benefits across the entire value chain, fostering more responsible and sustainable practices. This comprehensive approach will enable the identification and evaluation of key factors such as stakeholder awareness, market confidence, social acceptance, opportunities, drivers, and barriers influencing the uptake of WRR&R solutions.

The need for AWARE arises from the growing interest in the Water Circular Economy (WCE), which aims to mimic and restore the natural water cycle by transforming waste into resources. However, circularity alone does not necessarily lead to reduced environmental impacts, lower costs, or improved social outcomes compared to linear systems. Therefore, a holistic assessment of sustainability is essential. Although LCSA is a well-established methodology supported by international standards, its application in the WRR&R field remains limited and often produces non-comparable results due to inconsistent datasets, lack of transparency, and varying data quality.

AWARE addresses these challenges by tackling key sources of uncertainty, such as limited data availability for certain life cycle stages and the variability associated with local contexts and stakeholder-driven social data. By developing robust and sector-specific guidelines, the project will enhance the reliability, reproducibility, and practical relevance of LCSA studies.

Furthermore, AWARE is expected to foster wider adoption of LCSA in WRR&R, contributing to the achievement of the Sustainable Development Goals (SDGs) and the objectives of the Water4All partnership, and strengthening the role of integrated sustainability assessment as a key enabler of resilient and sustainable water resource management.



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