

Moving Towards a Circular Approach for Water Management: Placing Contemporary Research

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Introduction

- Pressures of continued economic growth and increased population are placing stress on a number of key resources, especially water.
- Wastewater can be repurposed to reduce freshwater demands.
- Research is critical to support practical applications of waste water uptake and provide decision support.
- As a large consumer of water and generator of wastewater, agriculture provides a case study
- Need to fit within sustainable development goals 6, 8 and 12 - ensuring access to water resources, sustainable consumption, production and economic development

Research Questions

- What inter-linkages between economy, environment and society are evident in the contemporary academic research?
- What are the differences in understanding the issue of wastewater re-use from various stakeholders?
- To what extent is circularity the focus of the existing research?

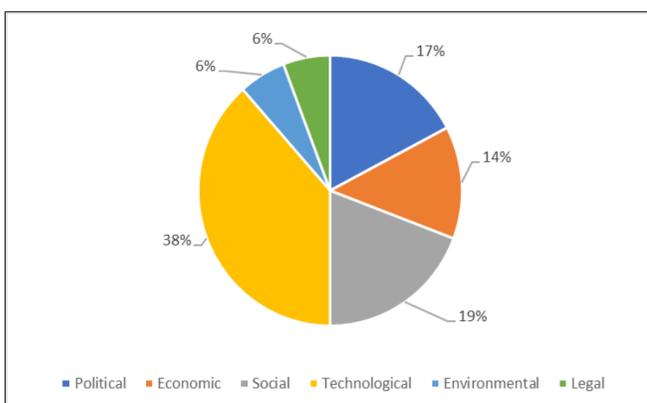
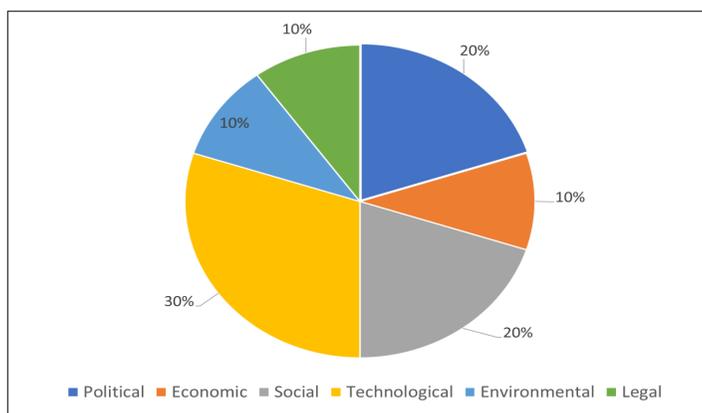


Figure 1: distribution of all articles according to PESTEL focus

Figure 2: distribution of articles with a circular economy focus according to PESTEL classification



Summary Findings

- 40% of articles focus on technological challenges for integrating wastewater into wider water supply
- Lack of research focuses on social and legal requirements to facilitate wider uptake
- Despite the circular nature of wastewater re-use, there is little explicit focus on circular economy and closed loop
- Future work should be focused on extending research towards addressing the gap between theoretical and actual applications of technologies

Search Procedure

Database Searching: Scopus & Web of Science

Search Terms:

water AND (re-use OR recycle OR repurpose); water AND re-use; wastewater AND re-use; "wastewater treatment" AND re-use; water AND recycle; "wastewater treatment" AND recycle
 water AND repurpose; excluded articles; wastewater AND acceptance; wastewater AND consumption; wastewater AND domestic supply; wastewater AND "domestic supply"; wastewater AND (industry OR industrial OR commercial supply); wastewater AND industry; wastewater AND "industrial supply"; wastewater AND commercial supply

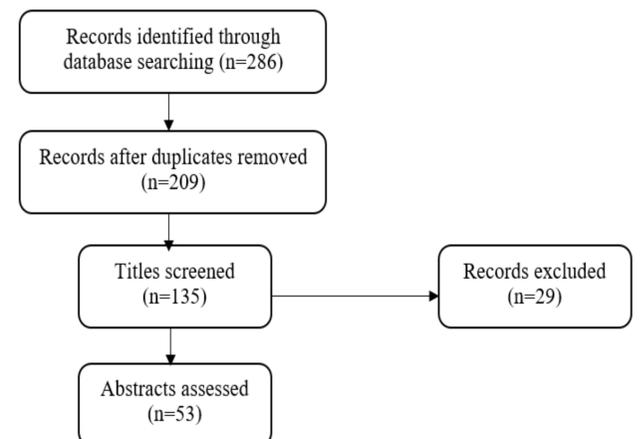


Figure 1: The systematic literature review article exclusion process

After filtration – Circular Economy, Closed Loop (reduced from 53 to 10)

	Example Text
Political	"new policies should be addressed in the short- and medium-term, as water scarcity is a current problem in the north and a future problem in the central zone." (Villamar et al., 2018)
Economic	"While the flexibility of the mathematical structure of the RCOT model allows for the representation of by-products and of open- and closed-loop recycling" (Lopez-Morales et al. 2019)
Social	"This proposed model was developed based on results in the current study, but not tested more widely. Future studies could investigate the applicability of this extended model to other technical pro-environmental innovations, i.e. other circular innovations within the household" (Poortvliet et al. 2018)
Technological	"During the last decade, impressive technological progress has been made to transform waste into valuable resources. A circular economy can be realized in close cooperation between government, science and commercial companies. The transition to a circular economy will only be possible when further innovations are made in many different technical processes" (van Leeuwen, 2018)
Environmental	"environmental assessment techniques and risk analysis using standardized methods (as cost-benefit analysis, life-cycle assessment5), and by ultimately making a real paradigm shift from a wastewater treatment plant to a water resource recovery facility, thus creating a real environmentally friendly "biorefinery" within a more circular economy framework" (Ait-Mouheb et al. 2018)
Legal	"This study is an early attempt to create a new basis for the development of a new consensual framework, based on the concept of converting agricultural products in a closed loop recycling management that ensures sustainability and promotes the organic nature-orientated farming to satisfy modern society demands" (Koutsos et al. 2018)