Water circular economy as an instrument of conservation in Natura 2000 site ROSCI0434 Siretul Mijlociu (Romania)

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Introduction

The escalating demand for urban water usage has intensified wastewater generation and water pollution, compounded by the disruptive effects of climate change on water cycles. Climate change compounds these challenges, altering the availability, timing, distribution, and quality of water resources, intensifying pre-existing water stressors in urban settings. The Circular Economy, oriented towards restoration and resource optimization, aims to minimize waste, harness resource potential, and foster sustainable innovation. Embracing three core principles—eliminating waste and pollution, promoting prolonged product and material use, and regenerating natural systems—the circular approach seeks to address water's significance in socioeconomic development, Sustainable Development Goals (SDGs), and ecological balance.

Recognizing the pivotal role of ecosystem services in humanity's future and the escalating conflict between resource exploitation and preservation, this study explores the viability of a circular water economy within the protected area ROSCI0434 Siretul Mijlociu in Romania.

The establishment of protected areas is a critical step toward preserving biodiversity and ecosystem services. Economic evaluations, such as the Economics of Ecosystem and Biodiversity (TEEB, 2010), indicate that investing in protected areas is not only cost-effective but also yields substantial ecosystem service benefits.

Figure 1. Water in Circular Economy and Resilience (WICER) Framework
(source: https://www.worldbank.org/en/topic/water/publication/)

Methods and materials

The research employs a comprehensive methodology, encompassing data gathering, assessment strategies, and stakeholder insights, to evaluate the potential and implications of implementing circular water practices in this pristine habitat. Central to the circular economy framework is the elimination of negative externalities, reduction of resource impact, and restoration of natural systems—particularly watersheds and ecosystems.

Methodologically, this study integrates diverse data sources, including hydrological data, ecological assessments, and societal parameters, to evaluate the potential for circular water models.

Results &Discussions

A circular and resilient water sector not only curtails waste and environmental harm but actively rejuvenates vital natural systems, acknowledging their economic value and crucial role in sustainability. Embracing nature-based solutions, this approach integrates nature into infrastructure, reducing costs, enhancing resilience, and mitigating climate change while safeguarding ecosystems.

Combining natural (green) and traditional (gray) infrastructure presents an opportunity to deliver cost-effective services while reducing risks associated with extreme events, pollution, and greenhouse gas emissions. Green infrastructure such as wetlands and forests, acting as carbon sinks, not only enhance resilience but also

contribute to climate goals when appropriately managed and conserved. Additionally, nature-based solutions facilitate resource recovery and ecosystem service restoration in urban areas, exemplified by constructed wetlands providing efficient and cost-effective wastewater treatment and nutrient recovery. (Table 1)

Table 1. Green and gray infrastructure

Service	Gray infrastructure	Green infrastructure - function
Water supply and sanitation	Reservoirs, treatment plants, pipe network	Watersheds: Improve source water quality and thereby reduce treatment requirements
		Wetlands: Filter wastewater effluent and thereby reduce wastewater treatment requirements
Urban flood protection	Strom drains, pumps, outfalls	Urban flood retention areas: Store stormwater and thereby reduce drain and pump requirements
River flood protection	Embankments, pump stations	River floodplains: Store flood waters and thereby reduce embankment requirements
Agriculture irrigation and drainage	Barrages/dams, irrigation and drainage canals	Agriculture soils: Increase soil water storage capacity and reduce irrigation requirements

Conclusions

Strategies under a circular economy paradigm aim to conserve water resources and mitigate pollution by expanding wastewater treatment facilities and restraining industrial pollutants. Additionally, initiatives focused on restoring watersheds, replenishing aquifers, and preserving natural capital play a pivotal role in nurturing and safeguarding the integrity of natural water systems. Such interventions, integrated into river basin planning frameworks, bolster environmental and economic benefits while enhancing inclusivity.

Moreover, a circular and resilient water sector not only curtails negative environmental impacts but also actively rejuvenates invaluable natural systems, acknowledging their economic significance and pivotal role in ensuring a sustainable future. Recognizing the intrinsic value of water resources, the circular economy framework emphasizes meticulous management, preservation, recharge, and restoration of aquifers and watersheds. Nature-based solutions, integral to this approach, contribute substantially to infrastructure systems' sustainability and resilience while mitigating climate change impacts.

In summary, the integration of circular economy principles within the water management framework of ROSCI0434 Siretul Mijlociu showcases a promising approach towards sustainable conservation practices. This research emphasizes the imperative of harmonizing economic activities with environmental preservation, ensuring the long-term resilience and vitality of natural ecosystems while meeting societal needs for water and other vital resources.

A circular economy, anchored on waste reduction, resource optimization, and natural system regeneration, holds promise in addressing water-related challenges within the context of sustainable development.

References

References should be made in the style (Dickenson, 2005), Marr and Morrissey (2010) or as Curtis *et al* (1996). Leave a blank line above the list of references, and also above the acknowledgements.

Delgado, Anna, Diego J. Rodriguez, Carlo A. Amadei and Midori Makino (2021):Water in Circular Economy and Resilience (WICER). World Bank, Washington, DC). https://www.worldbank.org/en/topic/water/publication/

Chausson, Alexandre, Beth Turner, Dan Seddon, Nicole Chabaneix, Cécile A. J. Girardin, Valerie Kapos, Isabel Key, Dilys Roe, Alison Smith, Stephen Woroniecki, and Nathalie Seddon (2020) :Mapping the Effectiveness of Nature-Based Solutions for Climate Change Adaptation. *Global Change Biology* 26 (11): 6134–55. https://doi.org/10.1111/gcb.15310.

Browder, Greg, Suzanne Ozment, Irene Rehberger Bescos, Todd Gartner, and Glenn-Marie Lange (2019), Integrating Green and Gray: Creating Next Generation Infrastructure. Washington, DC: World Bank and World Resources Institute. https://openknowledge.worldbank.org/handle/10986/31430.

Ellen MacArthur Foundation, ARUP, and Antea Group"Water and Circular Economy." https://www.ellenmacarthurfoundation.org/assets/downloads/ ce100/Water-and-Circular-Economy-White-paper-WIP-2018-04-13.pdf.

EMF (Ellen MacArthur Foundation) (2015): *Growth Within: A Circular Economy Vision for a Competitive Europe.* EMF.