



*Recommendations for policy initiatives on Water and
Circular Economy in European countries. Perspective of
waterCEmanagement project.*

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Marzena Smol^{1}, Dominika Szoldrowska¹, Beata Szatkowska², Renata Tomczak-Wandzel²
¹Mineral and Energy Economy Research Institute, Polish Academy of Sciences, Poland
²Aquateam COWI, Norway
Corresponding Author: smol@meeri.pl

INTRODUCTION

Water is undoubtedly the most important raw material in the world, needed for the survival of all organisms, including humans. In recent years, various initiatives have been undertaken to intensify activities to protect water resources in Europe, mainly through the implementation of ambitious circular economy (CE) model [1], [2]. The crucial importance of water is underlined in following facts:

- Water sustains life; without water, life would not be possible, including human survival itself [3].
- Water is at the base of sustainable development (SD) and specific Sustainable Development Goals (SDGs), including SGD2—zero hunger (end hunger, achieve food security and improved nutrition and promote sustainable agriculture), SDG6—clean water and sanitation (ensure availability and sustainable management of water and sanitation for all), SGD7—affordable and clean energy (ensure access to affordable, reliable, sustainable and modern energy for all), SGD 14—life below water (conserve and sustainably use the oceans, seas and marine resources for sustainable development), and others [4].
- Water is critical for socio-economic development, food production, energy production as well as healthy ecosystems [5]
- Water is important element of adaptation to climate change [6].

The presented importance of water and inclusion of water issues in SDGs was possible thanks to the long-term initiatives of different stakeholders involved in the green transformation that includes implementation of SD and CE principles as policy makers, business, education and scientific centres as well as non-governmental organisations (NGOs) [7].

The problems with water scarcity occur in various regions in the world, including the European Union (EU) countries. Therefore the European Commission (EC) for many years works on sustainable water management systems in the Member States [8]. The primary objective of the EU revolves around ensuring that all Europeans have access to water of good quality and in sufficient quantities. Simultaneously, the EU endeavours to uphold the good





status of all water bodies across the continent. To achieve these goals, EU regulations are designed to facilitate sustainable long-term water management, reduce water pollution, and safeguard aquatic ecosystems. In essence, the EU's commitment lies in establishing a comprehensive framework that addresses the multifaceted dimensions of water management, reflecting a dedication to a sustainable and thriving future. The current paper presents the most important directions of the EU in the transformation toward CE in water sector [9].

The revision of strategic recommendations in the EU documents on CE and water management and further recommendations for policy tools in this areas were studied in the international project “waterCEmanagement in practice – developing comprehensive solutions for water recovery and raising awareness of the key role of water in the transformation process towards a circular economy (CE)” that aims to strengthen the transformation towards CE in terms of circular management of water resources in Poland.

EUROPEAN UNION LAW ON WATER RESOURCES

EU water policy is one of the cornerstones of environmental protection in the EU. The rules protect water resources, fresh and saltwater ecosystems, and ensure our drinking and bathing water are clean. Currently, pro-environmental activities taken by the EC are indicted as a part of the **European Green Deal (EGD)** [10]. The EGD was launched in 2019, and provides each year new strategies for different sectors and aspects of economy. In water contexts, the Biodiversity strategy is important as well as a Zero Pollution Action Plan, a Farm to Fork Strategy, a Circular Economy Action Plan, a Chemicals Strategy for Sustainability, and a Climate Adaptation Strategy (incl. Climate Law).

In the context of the EGD, the **Water Framework Directive** [11] provides the main framework and the objectives for water policy in Europe. The EU strategy on adaptation to climate change aims to reduce water use and encourage water efficiency and savings, while guaranteeing a stable and secure drinking water supply. The Water Framework Directive aims to ensure water is used and managed in a sustainable way. The EU water policy covers a wide range of regulations regarding various aspects related to water:

- Bathing water - EU rules to ensure clean and high-quality bathing water across Europe.
- Groundwater - EU action to ensure good quantity and quality of groundwater.
- Marine waters - EU action to protect Europe's coasts, seas and oceans.
- Nitrates - Protecting waters against pollution caused by nitrates from agricultural sources.
- Drinking water - Improving access to drinking water for all.
- Floods - EU measures to manage flood risk and the risks floods pose to human health and the environment.
- Surface water - EU rules protecting surface waters from chemical pollution.
- Urban wastewater - EU rules to ensure that urban wastewater is properly dealt with.





- **Water Reuse - Managing water resources more efficiently and facilitating water reuse in the EU.**
- Water scarcity and droughts - Preventing and mitigating water scarcity and droughts in the EU.

In the current paper, we focus on water reuse as an effective alternative water supply that can help address water scarcity. It can ensure a safe and predictable source of water, whilst lowering the pressure on water bodies and enhancing the EU's ability to adapt to climate change. Reusing water after appropriate treatment extends its life cycle, thereby preserving water resources. **Water reuse is defined as the treatment of already used water to water of a quality that allows it to be reused in various utility processes.** Water reuse is commonly and successfully practised in several EU countries, as Portugal, Italy, Spain or Cyprus. Limited awareness of potential benefits among stakeholders and the public, and lack of a supportive and coherent framework for water reuse were identified as two major barriers preventing a wider spread of this practice in the EU.

The EU rules aim to encourage and facilitate water reuse in the European countries by dedicated regulation on water reuse for agriculture purposes. In 2020, the EC proposed the **Water Reuse Regulation** (Regulation (EU)2020/741) [12] that sets out:

- harmonised minimum water quality requirements for the safe reuse of treated urban wastewaters in agricultural irrigation,
- harmonised minimum monitoring requirements,
- risk management provisions to assess and address potential additional health risks and possible environmental risks,
- permitting requirements,
- provisions on transparency, whereby key information on every water reuse project is made available to the public,

To reduce water stress and promote water resource efficiency and as a response to increasing evidence that there is less rain in many parts of Europe, the European Union equipped with a new piece of legislation that will make the use of treated wastewater to irrigate crops safe, transparent and accessible to farmers: the Regulation on minimum requirements for water reuse for agricultural irrigation (the Water Reuse Regulation (Regulation (EU)2020/741)). A new Regulation entered into force in June 2020. The Water Reuse Regulation supposed to be applicable as of 26 June 2023 in the Member States, however not all EU countries decided to adapt those requirements. In general, the Water Reuse Regulation was proposed to increase the trust of consumers and farmers in this circular approach to the use of water, ensuring it is safe and reducing the pressures of abstractions on increasingly scarce water resources. Therefore, further actions should be taken by the Member States policy makers to adapt the WRR. This regulation should also help preserve the water resources needed by the aquatic and terrestrial ecosystems. This is a policy tool to help protect biodiversity, for achieving zero pollution and adapting to climate change [13].





This Regulation requires that urban wastewater, which has already been treated in accordance with the **Urban Wastewater Treatment Directive (UWWTD)** [14], is further treated to meet the minimum quality standards of the Regulation to be suitable for agricultural use. On April 10, 2024, the EC approved new EU regulations on the collection, treatment and disposal of municipal wastewater that will be adapted in planned new UWWTD. The European Parliament has adopted an agreement on the review of EU standards for water management and urban wastewater treatment. According to the new directive, by 2035, municipal sewage will be subjected to secondary treatment (i.e. removal of biodegradable organic matter) before being discharged into the environment in all agglomerations with an equivalent population (PE) of 1,000 or more. By 2039, tertiary treatment (i.e. nitrogen and phosphorus removal) will be used in all wastewater treatment plants covering 150,000. PE and more, and by 2045 in sewage treatment plants covering 10,000 PE and more. Additional treatment removing a wide spectrum of micropollutants (quaternary treatment) will be mandatory for all treatment plants above 150,000. PE (and above 10,000 PE based on risk assessment) until 2045.

As water stress is exacerbated by climate change impacts, the use of this reclaimed water in agriculture can play an important role in tackling water scarcity and drought. By setting minimum quality standards, the WRR promotes the safe use of reclaimed water in agriculture and ensures the protection of human and animal health and the environment.

Embodying the principles of the EGD and the CE, water reuse for agricultural purposes emerges as a strategic tool for conserving freshwater resources and enhancing resilience against water stress. By curbing water abstraction from rivers, lakes, and groundwater, water reuse aligns with sustainable practices, contributing to the overarching environmental objectives of the European Union.

In line with the European Green Deal and the principles of the CE, water reuse for agriculture can help preserve our freshwater resources and increase our resilience to water stress by reducing the water abstraction from rivers, lakes and groundwater. The reuse of water can contribute to the European Green Deal, both to the Circular Economy Action plan and to the EU Climate Adaptation Strategy.

Recommendations for future policy initiatives

CE is a priority of the economic policy of the EU In the CE model for water management, the main attention is paid to :

- improving the rational management of primary resources - water intake,
- sustainable management of secondary resources (waste) – water-based waste as wastewater, sewage sludges, rainwater, graywater and others.

The following recommendations for further policy actions are proposed:





- Actions to protect consumers by reducing their concerns about contamination, safety and quality. This can be achieved by specifying the scope of information campaigns for the public on water recovery. Currently, there are no guidelines on what should be included in such information and education campaigns, but they are required in accordance with the Water Reuse Regulation.
- Establishment of dedicated units (or delegating this task to existing national inspections) responsible for water management and quick detection of inappropriate technologies / continuous validation of the efficiency of modern water recovery technologies.
- Continue to promote clear and consistent regulations on the use of reclaimed water across European countries and the requirement for European countries that have not declared the implementation of the Water Reuse Regulation to provide a more detailed justification for the decision, including a social, economic and environmental analysis.
- Development of water-related indicators as part of CE monitoring at the level of European countries, in the current indicator system.
- Development of a monitoring framework for implemented water recovery solutions, with a group of CE indicators that can be compared at least at the unit level.
- Including the obligatory inclusion of water-based waste management in national and regional waste management plans, including wastewater management plans, CE actions plans, waste plans.
- Development of databases/platforms with information on quantity and quality of available reclaimed water, based on reliable reporting by the producer of reclaimed water.



These initiatives should strengthen the implementation of the objectives of circular water management, including water recovery and reuse in many applications.

Water reuse, as advocated by the WRR, is positioned as a climate-resilient solution. By promoting safe water use in agriculture, reducing water abstraction, and preserving freshwater resources, water reuse aligns with climate adaptation strategies outlined in the European Green Deal. As underlined above, many initiatives are taken by the EC form many years to support circular water management. Also at the national level, ambitious projects for the protection of water resources and their circular management are being implemented in member states. In the project waterCEmanagement, we focus on water recovery and reuse from rainwater, graywater and municipal wastewater. We have developed the small installation for water recovery from above water-based waste streams. The reclaimed is directed to agriculture purposes, for production of tomatoes in 2022. The obtained results are very promising in the context of treatment efficiency in terms of economic and environmental aspects. It is worth to notice here that our project was proposed to National Found of Environmental Protection and Water Management in the Call dedicated to CE implementation in Poland. The idea was to complete national efforts in preventing and minimising the effects



of drought, i.e., the Ministry of Climate and Environment (climate change adaptation programs, susza.gov.pl portal, etc.), the Regional Funds for Environmental Protection and Water Management (including e.g. My Water program), National Centre for Research and Development, State Water Holding Polish Waters, and other local and central subsidies for emerging retention systems offered by government. The results of the project are crucial for further adaption of the Polish system to the EU requirements, as well as accelerating the CE transformation. The project objectives and scope are in line with the current CE recommendations at the national and European levels i.e. the Circular Economy Communications (COM 398,2014) and the European Green Deal strategy to eliminate water pollution (COM 640,2019), as well as the Polish CE roadmap. Further actions are necessary to achieve the ambitious transformation goals towards CE.

Iceland 
Liechtenstein
Norway grants

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- [1] European Commission, “Communication from the Commission. Closing the loop - An EU action plan for the Circular Economy,” p. (COM no. 614, 2015), 2015.
- [2] European Commission, “Communication from the Commission. Circular Economy Action Plan for a cleaner and more competitive Europe,” p. (COM no. 98, 2020), 2020, [Online]. Available: https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf
- [3] J. Morris, “Developing and exploring indicators of water sustainable development,” *Heliyon*, vol. 5, p. e01778, 2019, doi: 10.1016/j.heliyon.2019.e01778.
- [4] United Nations, “Resolution adopted by the General Assembly on 25 September 2015. Transforming our world: the 2030 Agenda for Sustainable Development,” *United Nations Gen. Assem.*, p. A/RES/70/1, 2015, doi: 10.1163/157180910X12665776638740.
- [5] C. Pahl-Wostl, “Governance of the water-energy-food security nexus: A multi-level coordination challenge,” *Environ. Sci. Policy*, vol. 92, no. July 2017, pp. 356–367, 2019, doi: 10.1016/j.envsci.2017.07.017.



- [6] Z. W. Kundzewicz *et al.*, “Assessment of climate change and associated impact on selected sectors in Poland,” *Acta Geophys.*, vol. 66, no. 6, pp. 1509–1523, 2018, doi: 10.1007/s11600-018-0220-4.
- [7] M. Smol, C. Adam, and M. Preisner, “Circular economy model framework in the European water and wastewater sector,” *J. Mater. Cycles Waste Manag.*, vol. 22, no. 3, pp. 682–697, 2020, doi: 10.1007/s10163-019-00960-z.
- [8] K. Ramm, “Considerations Related to the Application of the EU Water Reuse Regulation to the Production of Snow from Reclaimed Water,” *Circ. Econ. Sustain.*, p. doi.org/10.1007/s43615-021-00075-4, 2021, doi: 10.1007/s43615-021-00075-4.
- [9] K. Ramm and M. Smol, “Water Reuse—Analysis of the Possibility of Using Reclaimed Water Depending on the Quality Class in the European Countries,” *Sustain.*, vol. 15, no. 17, p. 12781, 2023, doi: 10.3390/su151712781.
- [10] European Commission, “Communication from the Commission: The European Green Deal,” p. (COM no. 640, 2019), 2019.
- [11] European Commission, “Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment,” no. (91/271/EEC), 1991.
- [12] European Commission, “Regulation EU 2020/741, Minimum requirements for water reuse,” *Regul. 2020/741 Eur. Parliam. Counc. 25 May 2020 Minim. Requir. water reuse*, p. (EU 2020/741), 2020, [Online]. Available: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R0741&from=EN>
- [13] K. Ramm and M. Smol, “The potential for water recovery from urban waste water - The perspective of urban waste water treatment plant operators in Poland,” *J. Environ. Manage.*, vol. 358, p. 120890, 2024, doi: 10.1016/j.jenvman.2024.120890.
- [14] M. Preisner, M. Smol, and D. Szoldrowska, “Trends, insights and effects of the Urban Wastewater Treatment Directive (91/271/EEC) implementation in the light of the Polish coastal zone eutrophication,” *Environ. Manage.*, vol. 67, no. 2, pp. 342–354, 2021, doi: 10.1007/s00267-020-01401-6.

