



## Challenges and opportunities to manage wastewater and rainwater in Lisbon

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### ABSTRACT

Urban water systems are essential for public health, quality of life, and urban sustainability. Despite the progress in the last decades in managing wastewater and rainwater in urban areas, challenges persist and are exacerbated by climate changes. Existing urbanisation and infrastructure systems are valuable assets and ultimately are barriers to urban sustainability transition, including the type of drainage systems and their condition. New paradigms should act as drivers for change, incorporating these into new solutions while providing multiple benefits not limited to drainage.

Lisbon wastewater and rainwater systems have a long history, developed using the combined system paradigm, similar to those in other European cities of the same period. Systems built in the mid-eighteenth century, after the 1755 Lisbon earthquake, still function today. The transition to separate systems set as a requirement by new regulations in 1995 applied only to new developments. The efforts to improve the level of service by wastewater treatment plants in response to the Urban Wastewater Treatment Directive (91/271/EEC) led to a significant reduction of emissions of organic matter, nutrients and pathogens to surface waters, implied changes in the sewer systems leading to better performance during dry weather conditions. However, combined sewer overflows occur even for frequent rain intensities, and monitoring to provide an actual picture of polluted discharges is insufficient.

Monitoring to support performance assessment of services and city sustainability is challenging. It requires accounting for spatial and time variations and accurate data and information. Compliance with the annual quality of service national assessment, promoted by the Water and Waste Services National Regulator (ERSAR), created conditions to collect essential data at the utilities.

The Lisbon Municipal Master Plan objectives embrace the city transition by implementing green infrastructure and nature-based and water-sensitive solutions to meet city objectives while reducing flooding, emission of pollution to surface waters (e.g., by combined sewer overflows), air pollution and heat-island effect (CML, 2020). New challenges from the revised UWWT directive to come (Halleux, 2023) or the EU action plan Towards Zero Pollution for Air, Water and Soil (European Commission, 2021) are only achievable if the cities with combined sewer systems promote substantial changes. The drainage master plan (Plano Geral de Drenagem de Lisboa, PGDL, 2016-2030) already incorporates a set of actions to face some recurrent problems of flooding in Lisbon, primarily adopting the construction of large infrastructures including two large tunnels with a total length of 6 km.

Management of wastewater and rainwater systems develops by recognising the strategic issues requiring detailed planning. Among these, the sanitation department strategic plan setting the main strategies to pursue in Lisbon is a basis together with other tactical plans, e.g., the infrastructure asset management plan, providing a systematic approach to the operational plans in a city where a valuable infrastructure needs to be rehabilitated

and adapted, given the long service life of most components, and paradigm transitions. It is critical to separate wastewater based on its quality, i.e. the flows from different origins, to effectively tackle the various issues mentioned above. Within this context, control of the flows originating from each source and ensuring its adequate management allows the promotion of circularity, reduction of pollution and increase of efficiency.

Implementing local solutions to foster the separation of wastewater and stormwater and resourcing to nature-based and water-sensitive solutions contributes to urban sustainability in many dimensions. The cross-departmental work based on close collaboration to create solutions addressing multiple objectives is an opportunity that Lisbon municipality is pursuing, involving municipal services covering areas of urban water management, environment, energy, climate change, and urban requalification. In parallel, an ongoing ambitious assessment of the large sewers' structural condition to detect situations requiring urgent rehabilitation promotes circularity while improving performance. Extending the service life of system components reduces the need for new construction and the risk of failures leading to high consequences. Adopting nature-based and water-sensitive solutions is a challenge and an opportunity to alter the old drainage paradigm, rehabilitate and convert the existing combined sewer network, and foster the local management of rainwater (starting in upstream catchments) to reduce inflows to an overload system. A new paradigm can have multiple benefits, such as improving citizens' quality of life while increasing city resilience to climate change and better compliance with European directives and city commitments.

The presentation summarises the current situation in Lisbon, local challenges, and ongoing work.

#### **References**

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