



# Closing the Urban Water Loop

Madrid faces increasing pressure on its water resources because of climate change, population growth, and rising tourism, with the city now exceeding 3.5 million residents and more than 11 million visitors annually. Water supply depends heavily on climatic conditions and a complex system that transports water from mountain reservoirs located more than 70 km (~44 miles) from the city, making efficient water management essential for long-term resilience. In response, Madrid has developed a comprehensive water reuse strategy over the past 25 years, establishing a robust reclaimed water network primarily used for irrigating parks and green spaces and for street cleaning. Spain's recent national regulation on water reuse further strengthens this approach by promoting reclaimed water as a tool to address water scarcity, support circular economy principles, and enhance climate adaptation.

Major urban projects such as Madrid Nuevo Norte, one of Europe's largest urban regeneration initiatives, now present a significant opportunity to further scale water reuse through climate-smart planning and public-private collaboration.

✓ **REDUCE**

✓ **REGENERATE**



**MADRID, SPAIN**



**WASTEWATER**



## CHALLENGES FACED

Expanding the system requires constructing new pipelines and reservoirs within a dense, historic urban environment, where space is limited and infrastructure access can be complex. Coordination among national, regional, and local authorities has also been necessary, creating governance and financing challenges related to investment, operation, and maintenance of the network. Early implementation faced public skepticism and concerns about the safety and agronomic effects of reclaimed water on parks and green spaces.

## TECHNOLOGIES & SOLUTIONS USED

Madrid manages water scarcity through an extensive reclaimed water network, centered on a 180-km (112 miles) distribution ring connected to four production stations where wastewater treatment facilities apply advanced tertiary treatments, including physicochemical processes, filtration, and disinfection and prepare water for irrigation of parks, street cleaning, and selected industrial uses. The system includes reservoirs, pumping stations, and loading docks that distribute water through five interconnected networks.

### IMPACT & INSIGHTS



- The system produces over 10 million m<sup>3</sup> (~2.64 billion gallons) of reclaimed water annually, primarily used for irrigating parks and street cleaning.
- Since 2002, most municipal parks have been irrigated with reclaimed water, freeing substantial volumes of drinking water for essential supply needs.
- The Madrid Nuevo Norte redevelopment project (560 hectares) demonstrates the potential of urban development under climate neutrality and adaptation criteria.
- Citizens recognize and value reclaimed water as an alternative resource, with Madrid showing the highest level of public acceptance for water reuse in Spain.

### LESSONS LEARNED



- Collaboration across different levels of government is essential for effective water resource management, requiring shared strategic objectives, coordinated investments, aligned regulations, and integrated tariff policies within a common action plan.
- By leveraging Madrid citizens' strong emotional connection to water, whose quality is a source of pride and a hallmark of the city, the production of reclaimed water and the strategy of reserving drinking water for the most demanding uses can gain broad public support.
- Public-Private partnerships are critical for delivering resilient infrastructure and meeting climate adaptation targets.

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**To ensure safe and reliable operation, reclaimed water infrastructure is clearly identified using purple color coding and legible labeling on pipes, fittings, and manhole covers, with matching signage indicating reclaimed water conditions.**

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