



RESEARCH & STUDIES

EUROPEAN WATER RESILIENCE STRATEGY

ACEA'S CALL TO ACTION
AND BLUEPRINT FOR CHANGE

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Acea is a leading Italian infrastructure group and the largest integrated water services operator of the country, with a catchment area of about 11 million inhabitants and additional 10 million inhabitants served in Latin America. Acea is also Italy’s second largest electricity distribution services operator, with approximately 9.4 TWh of electricity supplied. Finally, Acea is a leading player in the waste management, with more than 1.8 million tonnes/year of waste handled.

Foreword



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Water is not just a resource—it is the foundation of life, economic stability, and industrial progress. Yet, water often remains an undervalued asset, frequently overlooked in policy discussions and investment strategies. The reality is stark: as climate change accelerates and technology demands more natural resources, Europe’s water systems are coming under increasing pressure, leading to an unsustainable status quo. At the same time, water’s long-term resilience is hindered by inefficient infrastructure with losses averaging 25%, a fragmented sector comprising more than 27,000 water operators, and an investment gap valued hundreds of billions.

This paper is the first in a series of publications from Acea Research & Studies, providing in-depth insights into the most pressing challenges facing the water sector. Welcoming the European Commission’s effort in paving the way for a European Water Resilience Strategy, Acea wishes to be an active part in this transformative process and developed this paper to offer a comprehensive analysis of industry-wide vulnerabilities and outline key solutions.

By shedding light on fragmentation, inefficiencies, and investment shortfalls, this paper proposes a structured framework for policymakers—centered on Rules, Regulatory Framework, Remedies, and Resources (Acea’s 4Rs)—to strengthen governance, optimize infrastructure, and unlock new financing mechanisms. Through concrete policy recommendations, this paper aims to guide decision-makers in securing a more resilient, efficient, and sustainable water sector for the future.

Strengthening Europe’s water resilience is not just an environmental concern; it is an economic and social imperative. Policymakers should lead the way in ensuring that Europe’s water systems are efficient, equitable, and future-ready. This paper serves as both a call to action and a blueprint for change.

Executive summary

Water is fundamental to life and economic prosperity, yet its true value remains largely underestimated. The European water sector, worth approximately **€290 billion**¹ and employing over **1.6 million people**², underpins nearly **70% of the EU's GDP**³. Despite its critical importance, water access is still a problem in Europe, with over 16 million people not having reliable access to safe and clean drinking water, and investment in water remains insufficient: of the €48 billion allocated to climate technology, less than €1 billion (under 3%) is directed toward water-related innovations⁴.

The global water industry is at a critical juncture, facing four interrelated macrorends that threaten its resilience: rising demand, accelerating freshwater depletion, an expanding water service divide, and persistent industry fragmentation. **Water consumption is increasing rapidly**, driven by AI-powered data centres, battery manufacturing, and hydrogen production, all of which require substantial water resources. At the same time, **climate change is reducing water availability** — since 1970, Europe's renewable internal freshwater resources per capita have declined by 15%⁵. Additionally, unlike other essential resources, water lacks a standardized market price, with its value determined by localized policies, contributing to a widening “**water service divide**”. In Europe, municipal tariffs vary significantly, from €2/m³ in Italy to €10 in Denmark⁶. However, national averages mask even greater variability at local level, where tariffs can differ by nearly a factor of five within a 100-kilometer radius. **Fragmented water governance** further complicates infrastructure management, investment planning, and creates operational inefficiencies. Europe has around 27,000 water operators⁷, and inefficiencies in distribution result in an average water loss of 25%, with peaks reaching 40-60% in some countries⁸. This fragmentation is also reflected in disparities in water infrastructure investment across EU Member States ranging from €20 to almost €180⁹.

To secure the future resilience of the European water sector, immediate action is required. In this regard, Acea welcomes the European Commission's effort in paving the way for a European Water Resilience Strategy and wishes to be an active part in this transformative process.

Acea calls for a Water Resilience Strategy grounded in four key levers (4Rs), carefully tailored to the unique geographic, climatic, and morphological characteristics of each economy:

1. Rules:

- Establishing a **central water governance body** at European and national levels that sets strategies and targets, translating them into actionable policies;
- Developing **integrated plans** involving governments, businesses, and local communities to ensure shared governance and management of water resources (e.g. policies, incentives, funds, etc.);
- Creating a **culture of water to raise global awareness** campaigns promoting virtuous consumption behaviors.

2. Regulatory framework:

- **Strengthening industry players** to drive major infrastructure investments and public-private partnerships;
- **Centralizing decision-making processes** at European and national level on key topics, such as tariffs and investment planning, to enhance efficiency.

3. Remedies:

- **Upstream:** Safeguarding and optimizing sources, by differentiating drinking and non-drinking water uses, such as for irrigation and industrial cooling;
- **Midstream:** Upgrading distribution networks, revamping infrastructure to reduce losses, and integrating new technologies such as AI, Internet of Things, and robotics;
- **Downstream:** Expanding wastewater treatment and reuse to pursuit the goal of “Net Zero Water”, and creating a circular economy where water is repurposed for agriculture and industry.

4. Resources:

- **Reforming tariff structures** with a nationally defined, equitable, and sustainable reference value to support efficient water resource planning;
- Prioritizing water resilience within **EU public funds** and financial frameworks;
- **Establishing new funding mechanisms**, such as an EU Water Fund, the next Competitiveness Fund, “blue bonds,” and adaptive financing tools to ensure long-term sustainability amid climate and economic shifts.

A well-functioning water sector is not just an environmental necessity—it is an economic and social imperative. Policymakers should act now to secure long-term resilience, competitiveness, and water security for future generations. Without intervening with specific policy actions, water issues will escalate, undermining economic growth and environmental sustainability.

Water: the forgotten giant

The water industry is vast and influences all sectors, yet its role as a key driver of economic growth remains largely overlooked. The European water supply, sewerage, waste management and remediation sector is worth approximately €290 billion¹⁰, spanning various sectors, including industrial, municipal, and agricultural uses. With 1.6 million people¹¹ employed in this field—around 1% of the total European workforce¹²—water plays a crucial role in all economic activities.

Nonetheless, **water is a key driver of economic growth.** Water directly and indirectly contributes to approximately 70%¹³ of the European GDP, with a total economic value of more than €11 trillion.

Despite its importance, water access issues are far from being solved. Over 16 million people in Europe still do not have reliable access to safe and clean drinking water, meaning they rely only on untreated sources. Additionally, more than 31 million people lack access to proper sanitation facilities¹⁴, increasing the risk of disease and environmental contamination.

Ultimately, **water issues are still largely ignored with limited focus on water investment and innovation.** In 2023, while global climate technology funding totaled €48 billion, only €1 billion—less than 3%—was allocated to water technology (i.e., technology focused on the sustainable and efficient management of water, and freshwater in particular, as a resource)¹⁵.

€ 290 billion
European water valued

1.6 million
people employed in the water sector

70%
impact of water on European GDP

16 million
people with no access to safe water

less than 3%
of climate technology
investments allocated to water

4 macrotrends threatening the resilience of the European Water industry

The European water industry is at a pivotal juncture, facing four converging macrotrends that threaten its stability and resilience: **unsustainable demand increase, accelerating freshwater resources depletion, widening water service divide**, and a **persistent heterogeneity** of governance and infrastructure development.

Unstable water demand growth

Over the past 50 years, water demand in Europe has steadily increased¹⁶, primarily due to population growth, rising urbanization rates, and industrialization. Water consumption has more than doubled since 1900, with annual withdrawals now exceeding 185 billion cubic meters¹⁷. Despite several conservation efforts, which helped to reduce withdrawals per capita by about 20% in the last 20 years¹⁸, the continent will have to face the needs of emerging high-water-demand sectors, including data centers, green hydrogen, and tourism.

AI-driven data centers alone could increase global water withdrawals by 4.2–6.6 billion m³ by 2027¹⁹, equivalent to 4–6 times Denmark’s annual water consumption.

Similarly, green hydrogen production—seen as a cornerstone of the energy transition—is projected to consume about 5.0 to 5.6 billion cubic meters of freshwater annually by 2050²⁰, equal to Portugal’s annual water consumption.

Finally, tourism in Southern Europe is projected to continue its upward trajectory, intensifying existing pressures on water resources in the region, particularly during peak season in the summer. In 2024, Tourism in Southern Europe reached new historic highs, recording more than 328 million international arrivals²¹. Such influx is not expected to decrease, as the sector expects a 3% annual growth by 2030²².

Growing challenge of resource availability

The sustainability of global water resources is under severe strain due to three interrelated factors: diminishing freshwater availability, escalating water losses, and climate-induced variability. These simultaneous challenges undermine equitable access to water and threaten economic and social stability.

European **freshwater availability per capita has been decreasing at an alarming rate**. In 1970, average renewable internal freshwater resources per capita stood at 3,400 cubic meters; by 1990, they had dropped by almost 10% to 3,100, and by 2020, by another 5% to 3,000²³. 41% of the European population experiences water scarcity for at least a quarter of the year, while an even more alarming 30% of southern Europeans endure permanent water stress²⁴.

The **inefficiency of water distribution systems exacerbates this crisis**. In Europe, approximately 25% of urban water is lost due to leakage, with peaks between 40 and 60%²⁵. The persistent infrastructure investment shortage further aggravates water losses, as water system inefficiencies tend to be directly correlated with investment rates. Thus, addressing water losses by investing in infrastructure modernization and upgrades is critical to alleviating growing water stress levels and ensuring sustainable resource management.

Finally, **climate change further exacerbates both freshwater scarcity and water distribution inefficiencies**. Rising global temperatures, shifting precipitation patterns, and extreme weather events have led to a 60% decline²⁶ in global renewable freshwater resources per capita since 1961. The economic impact of climate-induced water stress is profound: between 2021 and 2023, the European Union incurred over €162 billion in damages²⁷. Projections indicate that by 2050, high-income countries could see an average GDP decline of 8%²⁸.

The “water service divide” and its socioeconomic implications

Despite its fundamental role in sustaining life and economic development, water remains undervalued and inconsistently priced. Unlike other essential resources, water lacks a standardized market price, with its real value undermined by fragmented and localized policies, contributing to a widening “water service divide”, instead of an integrated, equitable framework. Disparities in pricing and accessibility is reflected in every water sector, from municipalities to agriculture and industry.

European municipal tariffs range from €2.1 and €2.3 per cubic meter in Italy and Spain respectively, to €6.3 in Germany and €9.9 in Denmark²⁹. However, these national averages hide even greater variations at local level, where tariffs can differ by nearly a factor of five within a 100-kilometer radius.

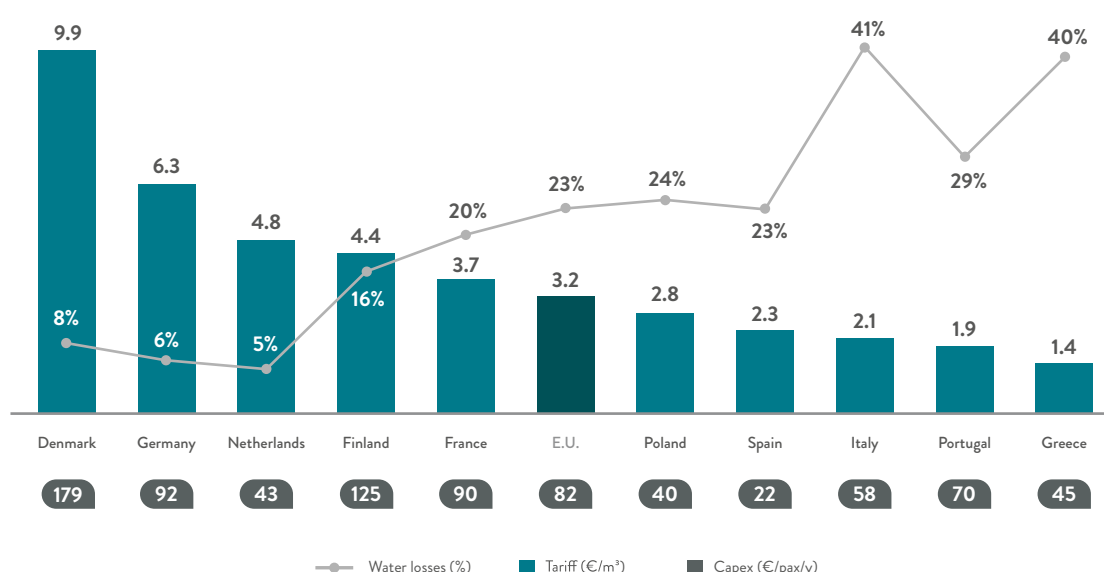


Figure 1 – European water service inequality: tariffs, water losses, CAPEX/inhab. (Acea own elaboration)

Although **agriculture** is the sector exerting the highest pressure on renewable freshwater accounting for 40% of European withdrawals, irrigation water is often priced significantly lower than domestic water, as low as €0.10/m³⁰. This discrepancy persists even though the EU Water Framework Directive mandates that water pricing policies should follow the cost-recovery principle. Extensive subsidies, estimated to surpass €55 billion in Europe³¹, influence agricultural water pricing. While these subsidies support food security and rural livelihoods, they also contribute to unsustainable practices. Subsidized irrigation infrastructure has been linked to a 21–28% rise in water use, accelerating groundwater depletion³². To foster a more equitable and sustainable water system, **subsidies should be reshaped to promote efficiency**.

Finally, **water pricing in the industrial sector is heavily influenced by the uneven application of pollution control policies and principles across EU Member States**, such as with the application of the polluter-pay and cost-recovery principles enshrined in the Water Framework Directive³³. Consequently, many enterprises do not bear the costs imposed by the pollutants they release into the water³⁴. Additionally, while regulatory frameworks focus on pollution control, incentives for net-zero water solutions remain largely absent. This gap highlights the need for policy innovations that align industrial water pricing with sustainability objectives, ensuring that conservation efforts extend beyond regulatory compliance to proactive resource management.

The water sector's heterogeneity of investments, regulation, and technology

The global water sector faces three critical challenges that hinder its ability to ensure sustainable and efficient water management: a persistent infrastructure investment gap, regulatory fragmentation, and slow technological adoption.

Investment shortages remain a major obstacle in Europe. Spain invests only €23 per capita in water infrastructure, Italy less than €60, with certain areas investing under €10 per capita, while leading nations such as Denmark, the UK, and Estonia allocate €130–€180 per capita³⁵.

The **fragmented nature of water governance further complicates infrastructure management, investment planning**, and creates operational inefficiencies. In Europe, there are over 27,000 operators managing water systems, for an average of about 17,000 inhabitants served per operator³⁶. Also, the structure of water providers varies significantly, from large private operators in France to predominantly public utilities in Sweden and Germany³⁷.

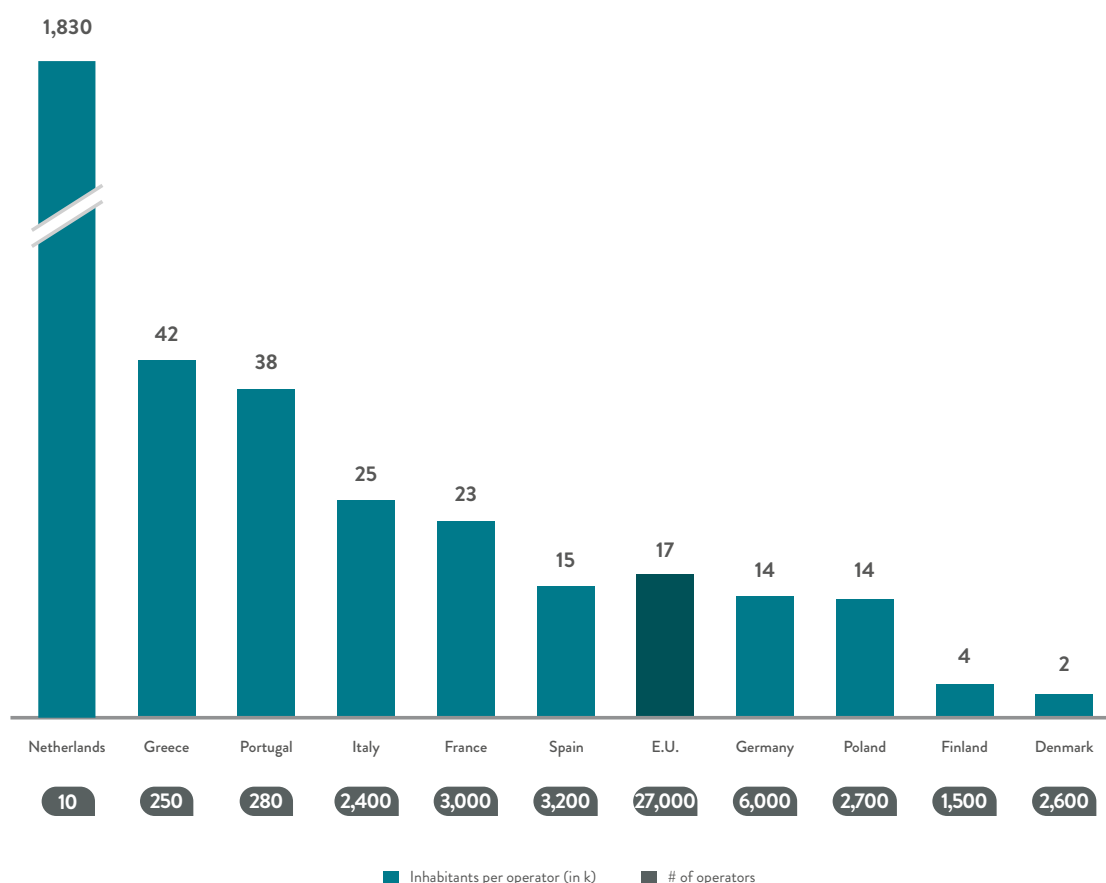
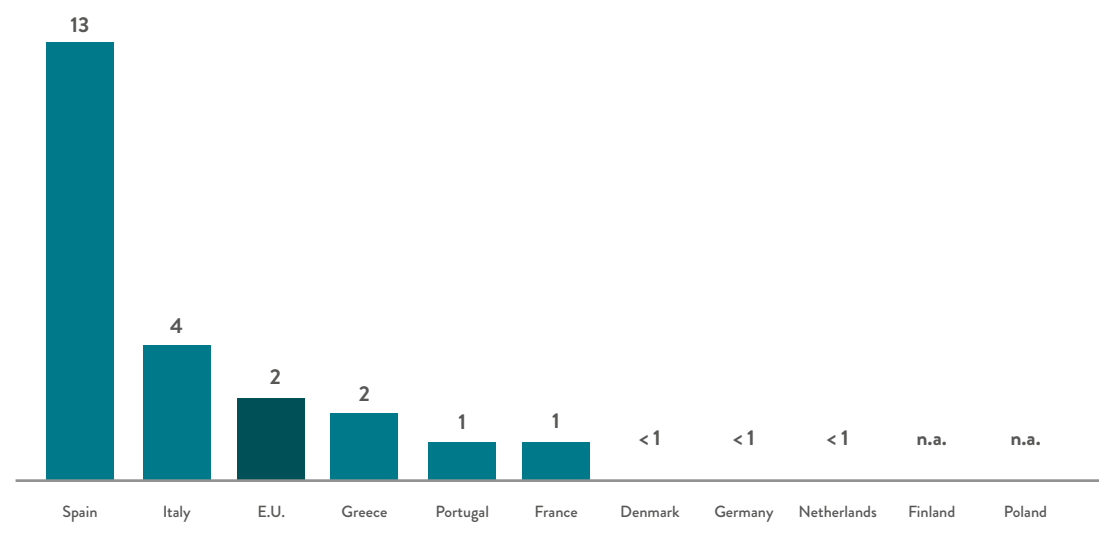


Figure 2 - European water service fragmentation: no. of operators/inhab. (Acea own elaboration)

While other utility sectors, such as electricity and gas, have embraced digital transformation, **the water sector lags significantly in adopting advanced technologies**. Wastewater reuse, for instance, remains underutilized in most regions. Europe's reuse is below 3%, with some countries not allowing water reuse for agricultural irrigation (e.g., Poland and Finland). Similarly, the integration of smart technologies in water management also remains limited. While 60% and 45% of European households are equipped with smart electricity and gas meters respectively, only 12% have smart water meters installed³⁸. Emerging technologies such as AI, IoT, and robotics offer immense potential to optimize water distribution, detect leaks, and enhance resource management. Accelerating digitalization within the water sector will be crucial for improving efficiency, reducing operational costs, and enhancing resilience against climate-induced disruptions.

Wastewater reuse rate (% WWT)



Smart metering adoption (% European households)

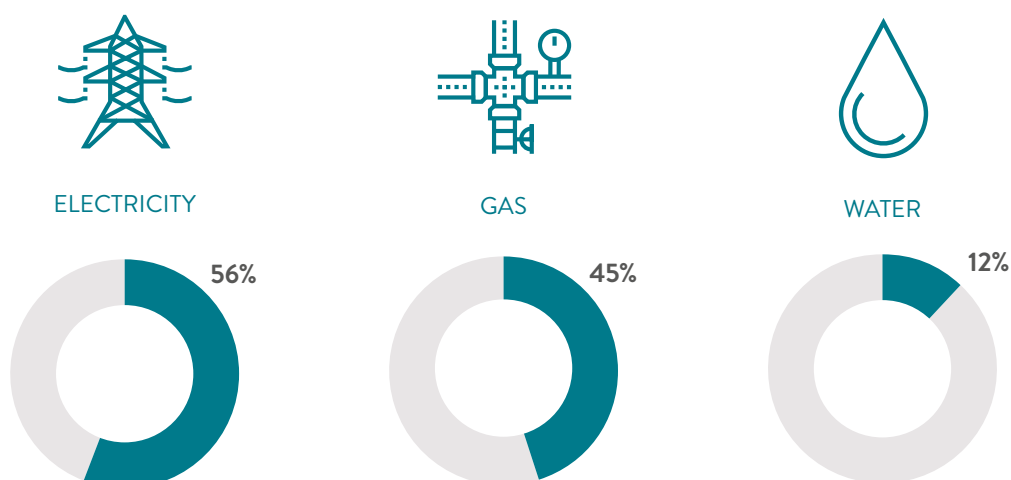


Figure 3 - European wastewater reuse rate and smart metering adoption rate (Acea own elaboration)

The water industry needs a new paradigm

The water industry needs radical changes to mitigate the climate risk, reduce the disparity, and ultimately improve the overall financial and operational performance of the sector. This chapter outlines four enablers (Water's 4 Rs) to win this challenge: Rules, Regulatory, Remedies, and Resources.

Acea's 4 Rs - the four levers to win the challenges



Figure 4 - Acea's 4 Rs

1. Rules

Water governance requires a new, integrated system that eliminates fragmentation and fosters sustainable management practices. Europe needs a centralized governance framework with a cohesive strategy that engages governments, businesses, and local communities in water resource management, fostering a robust culture of water.

The first step would be to identify a water-dedicated supranational authority responsible for setting objectives and targets and translating into actionable policies, developing trading mechanisms, and coordinating funding structures. Next, national water-dedicated ministries should implement policies tailored to local geography, resource availability, and economic conditions. Unlike other sectors, such as telecommunications and energy, water governance lacks a single, authoritative entity to enforce regulations. Water needs new frameworks, policies and investments. Estimates suggest that hundreds of billions of euros are needed to finance investments to comply with European water directives and to strengthen the resilience of water infrastructure. However, these figures likely underestimate the true scale of required resources. To bridge this investment gap, close collaboration between businesses and governments is crucial.

Finally, a centrally-coordinated culture of water is essential to raise global awareness campaigns, highlight the importance and scarcity of water, and promote a virtuous and conscious use of resources (e.g., through educational programs).

2. Regulatory framework

Water governance requires a structural regulatory transformation to promote a more efficient water infrastructure, circular water economy, and water use transparency.

Firstly, regulators should work towards overcoming water infrastructure sector fragmentation by encouraging consolidation, geographic expansion, and the formation of industrial champions, promoting PPPs. These champions can undertake major infrastructure projects, and drive innovation. Smaller utilities often lack the financial and technical capacity to address the complex challenges discussed herein.

Next, regulators should focus on closing the legislative gap on water circularity for agriculture companies and industrials, with homogeneous policies on minimum water quality standards and savings targets. Today, water-intensive sectors have little incentives to invest in reuse or circular water economy.

Finally, policymakers should strengthen corporate water reporting in addition to other sustainability disclosure requirements. European Union's Corporate Sustainability Reporting Directive (CSRD) already mandates companies to record water-efficiency metrics and mitigation strategies as of ESG obligations, yet without binding rules. Beyond regulatory frameworks, European financial markets should increasingly incorporate water risk assessments into investment decisions, requiring corporations to evaluate water dependencies across their supply chains.

3. Remedies

To address water challenges effectively, a comprehensive investment package is required, along the entire water value chain: from source safeguard and optimization to distribution network upgrade and wastewater treatment capacity boost.

Sources safeguard and optimization

The foundation of a sustainable water future begins by safeguarding natural water sources through aquifers protection, nature-based solutions (NBS), rainwater collection and new storage systems.

Aquifers represent key underground reservoirs for drinking water and industrial use. Maintaining and protecting these aquifers is essential for ensuring a steady supply of groundwater, but it should be balanced with its natural replenishment rate to avoid over-extraction, which can cause depletion and ecosystem degradation.

Rainwater collection is an alternative water supply strategy for farmers and industrial operators. Especially in agriculture, rainwater and fog harvesting not only conserve water, but also mitigate soil erosion and flooding. Water storage capacity can be more efficient through the rehabilitation of existing dams and basins. In regions where water demand is more localized, smaller basins can provide a targeted solution to meet local needs. These small-scale storage systems help manage water distribution and mitigate flood risks, providing essential water supply during dry spells and acting as buffer zones against excessive rainfall. Furthermore, the development of underground water storage systems can offer an innovative solution to water scarcity and flood prevention issues. These systems are especially useful in large cities and rural areas, where rapid urbanization and climate change are increasingly affecting water availability and flood control.

Finally, increasing the use of desalination and purification technologies can provide an additional source of freshwater, particularly in arid and coastal regions where traditional freshwater sources are limited. Desalination can help with water scarcity, but it should be integrated into existing infrastructure to avoid inefficiency. Careful planning is needed to ensure it supports the water network and addresses environmental impacts.

Upgrading the distribution network

Investing in distribution networks revamping and developing interconnection plans are essential to ensure resilient water systems, especially through new technologies.

As a first step, the water network needs to accelerate its path towards grid automation and digitalization, primarily throughout large-scaled installation of smart water meters. Next, District Metered Areas (DMAs) can further increase optimization, by dividing large distribution networks into smaller, manageable areas to improve monitoring and enhance operational control.

Emerging technologies, such as Internet of Things (IoT) sensors, AI with cloud computing, and robotics are indispensable tools to improve efficiency and reduce operational costs. IoT sensors collect real-time data on water pressure and flow, while advanced AI models can process this data to predict leaks and optimize water distribution. Then, the latest robotics solutions can directly support repairs by optimising time and increasing employee safety. Finally, distribution networks require interconnection, even cross-borders, allowing for the efficient sharing of resources during droughts or other extreme weather events.

Wastewater treatment boost

Boosting wastewater treatment capacity and reuse is another critical component. Advanced wastewater treatment processes not only ensure that the water returned to natural bodies, such as rivers and seas, meets strict quality standards, but also make it suitable for reuse.

In many industrial settings, treated wastewater can be used for cooling or other non-potable applications, reducing the demand for fresh water. In the EU alone, 1 billion m³ of treated urban wastewater is reused annually, but 6 times more treated water could be reused compared to current levels³⁹. Especially in agriculture, reusing treated municipal and industrial wastewater for irrigation offers a sustainable alternative, enriching soil with essential nutrients like nitrogen and phosphorus, while reducing reliance on chemical fertilizers. The adoption of reuse practices fostered by new technological solutions paves the way to pursuing the “Net Zero Water” goal, the ambitious objective aimed at maximizing water reuse across multiple processes, thereby significantly reducing overall consumption and waste.

4. Resources

The current water financing system has led to inadequate per capita investments and a persistent infrastructure gap in many European countries. **The water industry needs a better tariff standardization and an increase of the public funding available.**

First off, tariffs should be standardized—either regionally or nationally—to ensure an equitable and sustainable pricing to both reinforce the true value of water for end consumers, and to support efficient water systems.

However, tariffs alone cannot bridge the investment gap. Given the scale of infrastructure renewal required, regional authorities, financial institutions, and private investors should collaborate to develop structured funding mechanisms that accelerate modernization and drive water net-zero goals. These funding mechanisms should prioritize investments in nature-based solutions, infrastructure revamping, smart water technologies, and net-zero solutions. In practice, public finance should be revised to elevate water resilience as a cross-cutting priority, securing dedicated funding in the next EU Multiannual Financial Framework (MFF).

Finally, sustainable water use remains largely unaddressed. Policymakers should redirect subsidies from water-intensive sectors towards innovative financing models, such as water rights pricing and trading schemes, cap water withdrawals, and incentive programs, to promote net-zero water solutions. It is crucial that existing EU funding mechanisms are revised, including an EU Water Fund for long-term projects, the next Competitiveness Fund, Knowledge and Innovation Communities (KICs) financing, extending “blue bond” access, and specific financing tools. Ultimately, financing models should integrate adaptive financial mechanisms to address unforeseen climatic or socio-economic changes, ensuring the long-term sustainability of water resilience projects.

Conclusions

Water is the foundation of economic development and public well-being, yet its challenges remain overlooked. As demand rises and resources become increasingly scarce, the sector faces fragmentation, underfunding, and inefficiencies. Without strategic intervention, these issues will escalate, undermining economic growth and environmental sustainability.

Acea calls for specific policy actions. **Revising financing mechanism and securing public funds in the next Multiannual Financial Framework (MFF)** to the water sector will drive innovation and infrastructure modernization, while a **centralized governance framework** at European and national level will ensure coordinated decision-making and effective resource management strategies. Additionally, **targeted investment packages along the value chain** will support the establishment of a “Net Zero Water” economy.

A well-functioning water sector is not just an environmental necessity—it is an economic and social imperative. **Policymakers should act now** to secure long-term resilience, competitiveness, and water security for future generations.

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