Urban
Insight
By Sweco

Too much, too little, too polluted

Taking on Europe´s water challenges

SWECO

Although water stress affects around 20% of Europe's land and 30% of its population, smarter, targeted water management and circular water solutions are recognised as important measures to support resilience in water-stressed regions.

Europe's water challenges fall into three main categories: too much water from flooding, too little water from drought and insufficient rainfall and inefficient systems due to ageing infrastructure and growing competition for scarce water.

Emerging micropollutants, including PFAS, pharmaceuticals and industrial chemicals, have now been detected in most water bodies and are difficult and costly to remove.

The real value of water goes far beyond its price, reflecting its importance for health, ecosystems, industry and long-term resilience.

Too much, too little, too polluted

Taking on Europe´s water challenges

Content

Executive summary

Europe's drinking water and wastewater systems are under increasing pressure from climate extremes, rising demand, pollution and aging infrastructure. Even in regions with historically reliable supply, current service expectations exceed system capacity, while water tariffs often cover only a fraction of the true cost of providing safe and resilient services.

Sweco's analysis shows that water tariffs in many European countries do not reflect the real cost of maintaining reliable and climate-resilient water systems, leaving Europe underprepared for climate change and dealing with emerging contaminants such as PFAS. Stricter treatment requirements—such as advanced removal of micropollutants—are expected to increase costs by around 6%, with the largest impact in countries with low current water prices.

Despite these challenges, proven solutions already exist. Circular water systems, advanced treatment technologies and integrated water management are strengthening resilience across Europe through measures such as rainwater utilisation, upgraded wastewater treatment to address micropollutants and wastewater reuse.

Based on these experiences, Europe's water resilience can be strengthened through three interconnected strategies

- Integrated water resource management. Prioritising catchment-based management, moving from isolated, end of pipe measures to a multiple barrier approach, controlling chemical emissions and establishing protection zones around vulnerable water sources.
- Investing in modern, climate-resilient urban infrastructure. Increasing water retention capacity in urban regions through the use of measures such as permeable surfaces and strengthening resilience through nature-based solutions, improved stormwater management and circular water systems to adapt systems to both droughts and extreme rainfall, upgrading networks to reduce leakage and expanding treatment to handle micropollutants.
- Governance and community engagement. Increasing public awareness about water facts, encouraging citizens to protect water resources, building platforms for communication.

Recognising the true value of water and aligning investments with its environmental, social and economic impacts will enable Europe to build resilient, sustainable water systems and secure clean water in a changing climate.

1. Make water risks a standard requirement - integrate systematic assessments of water quantity, quality and infrastructure risks in plans, permits and investment decisions.
2. Protect water at the source - stop pollution before it reaches the groundwater and surface water.
3. Adopt integrated source-to-tap water management - replace end-of-pipe measures with a multiple-barrier approach across the full urban water cycle.
4. Plan and finance renewal of water infrastructure - use risk-based asset management to prioritise renewal.
5. Control pollution and emerging contaminants - combine tighter regulation, treatment and source control to manage micropollutants in the water.
6. Recognise the real cost of water - align tariffs and investments with the real long-term costs and risks connected to water services.

Introduction:

The Importance of water in a changing Europe

Across Europe, access to clean, safe drinking water has long been taken for granted. Turning on the tap and expecting fresh, high-quality water has been a defining feature of modern urban life and a cornerstone of public health, economic development and social stability. For decades, reliable water services have been one of Europe's great infrastructure successes. Today, that assumption is increasingly being challenged.

Climate change, more frequent and severe weather events, pollution and growing competition for water are placing unprecedented pressure on freshwater resources across the continent. Already, around one third of Europe's population experiences water stress at least one season per year[1], including regions that have historically enjoyed abundant supply. Prolonged droughts, record-breaking heatwaves and changing rainfall patterns are turning water scarcity from an exception into a recurring reality.

In Europe, electricity cooling uses the largest amount of water, accounting for around 33% of water usage, followed by agriculture 31%, public water supply 21%, manufacturing 14% and mining 1%[2].

It is essential to consider water as a whole and in its cycle, particularly in the urban environment where challenges such as water scarcity driven by climate change and increasing pressure on ageing water infrastructure due to urbanisation are becoming more pronounced. (Figure 1).

In the urban water cycle, water is abstracted from surface water or groundwater, treated through multiple stages and distributed via networks to households and industry. Wastewater collection and treatment systems then ensure that water quality is restored before it is returned to the natural environment, completing the cycle.

It should be noted that water and energy systems are strongly interdependent. Energy is required throughout the water cycle to extract, treat, distribute and manage water and wastewater. According to the International Energy Agency, the energy sector accounts for roughly 10% of global freshwater withdrawals, while water-related activities consume about 4% of total global electricity use. In water-scarce regions, this share is even higher due to energy-intensive processes such as desalination.[3]

Drought

10%

of groundwaters in Europe are affected by unsustainably high levels of water withdrawals.[4]

34%

of the EU is affected by water scarcity.[5]

Flooding

Around 12%

of Europe's population live in areas potentially prone to river flooding.[6]

Pollution

37%

of surface water bodies in Europe achieve good ecological status.[7]

65%

of Europe's drinking water is supplied by groundwater.[8]

EUR 75 billion

a year is the cost of nutrient pollution in Europe.[4]

Health cost

EUR 52-84 billion annually

estimated cost for persistent pollutants, such as PFAS, that keep accumulating in European waters with associated health impacts.[9]

Figure 1. Europe's water under pressure – flooding, pollution, drought and rising societal costs.

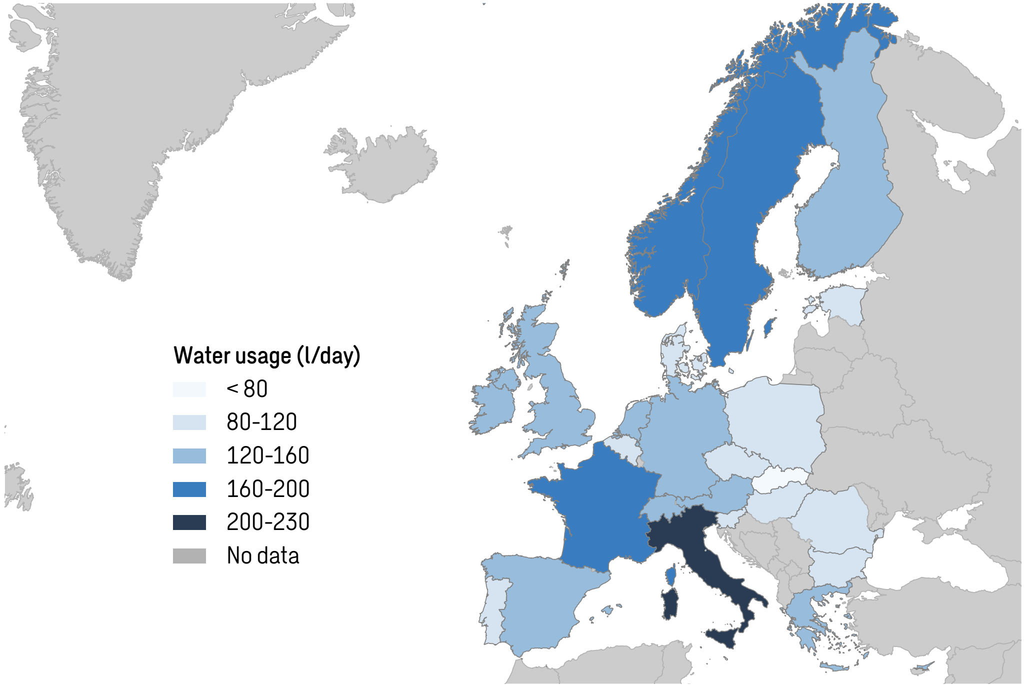


Figure 2: Water usage in Europe[10]. Map by Sweco based on data by Eureau.

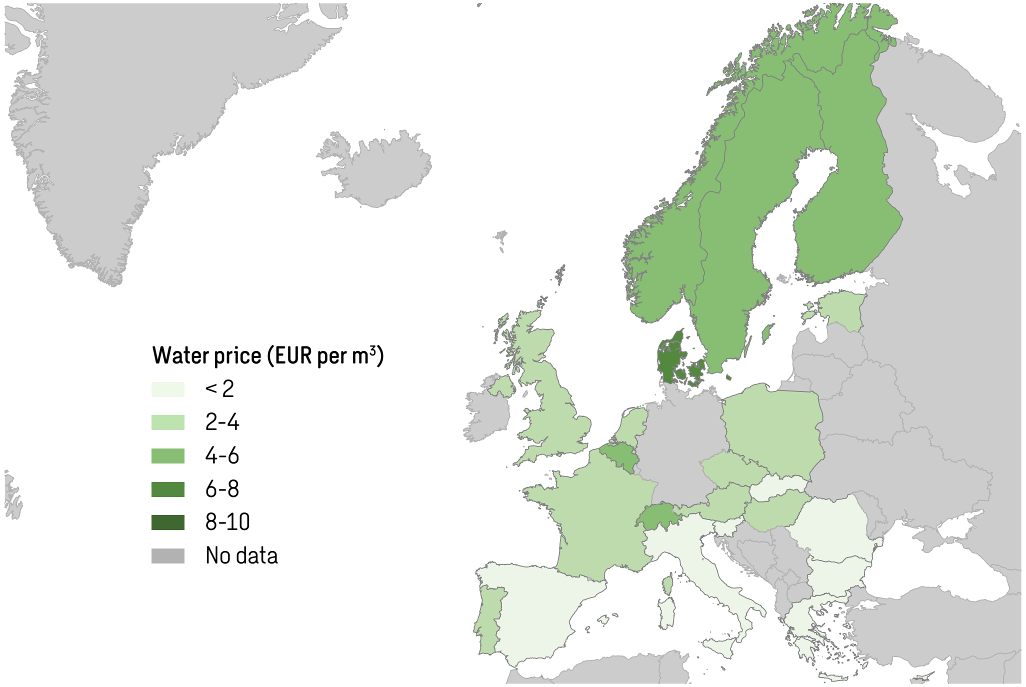


Figure 3: Price of water in Europe.[10] Map by Sweco based on data by Eureau.

In recent decades, municipal water demand has grown significantly compared to other sectors and is expected to continue increasing as urban populations expand and water supply and sanitation systems are further developed.

Figure 2 shows water usage levels across Europe. In the Nordic countries, Sweden and Norway rank among the highest, with 176 and 189 l/day respectively, while Denmark's usage is substantially lower at 109 l/day.

One significant driver for the usage of a resource or product is the price. Figure 3 shows the cost for the consumer of buying one cubic metre of tap water in different countries. Italy, that has a high consumption of tap water, has one of the lowest prices, whilst Denmark, that has relatively low consumption but is located in a high consumption region, has Europe's highest price for drinking water at 9,3 EUR/m3. These maps suggest that there is a correlation between a high price and a lower consumption.

Wastewater management plays a critical and often overlooked role in protecting water quality, ecosystems and public health. Wastewater treatment plants are increasingly expected to remove not only nutrients and pathogens, but also micropollutants, including the residues of pharmaceuticals, chemicals and microplastics. Today, a large amount of different micropollutants have been detected in European water bodies, many of which existing treatment systems were never designed to handle.

Beyond environmental and public health concerns, water is also becoming a matter of resilience and security. Unequal access to clean water or attractive water environments can reinforce social disparities. Both water scarcity and flooding can become breeding grounds for conflict, even between states. By focusing on sustainable water management, we can build safer, more cohesive societies where everyone has access to this vital resource. Digitalisation offers new opportunities to strengthen resilience through smarter monitoring, predictive maintenance and more efficient use of scarce resources, while also placing new demands on system robustness and cyber security.

At its core, Europe's water challenge is about securing access to clean, safe and affordable water. As scarcity, pollution and ageing infrastructure increasingly threaten reliable supply, safeguarding drinking water becomes essential to public health, social cohesion and economic stability.

Sustainable management and smarter systems will be key to ensuring that clean water remains available to all, even in a changing climate. In this report, Sweco discusses how we can best work towards achieving this important goal.

A forward-looking water policy to meet Europe's water challenges

Europe's water challenges can be grouped into three main categories: too much water, in the form of flooding caused by extreme rainfall and overwhelmed systems; too little water, driven by droughts, insufficient rainfall, old systems where water is lost due to age or where infrastructure has not been updated and increasing competition for scarce water resources between households, agriculture and industry; and degraded water quality, where pollution and emerging contaminants compromise both ecosystems and drinking water sources.

Together, these challenges underline the need for a coherent and forward-looking water policy that treats water as a strategic resource across sectors and scales.

What´s the solution?

- Addressing flooding, scarcity, pollution and infrastructure renewal requires long-term planning, regulatory consistency and sustained investment.
- By integrating water considerations into climate, energy, land-use and urban policies, decision makers can strengthen resilience, safeguard public health and ensure equitable access to clean and affordable water in a changing European climate.

Too much:

The era of water volatility

Climate change has accelerated the water cycle, leading to more frequent and intense precipitation events. Critical infrastructure failures resulting from rainfall-induced floods pose substantial risks to society, public health, economies and the environment.

Recent heavy flooding in Europe demonstrates that extreme rainfall can severely disrupt cities and critical infrastructure, resulting in enormous damage and costs.[11] In addition, Europe's coastal cities and low lying areas are at risk of flooding from rising sea levels and storm surges.

In 2024, approximately one-third of the European river network exceeded the high flood threshold, the most widespread flooding recorded since 2013, affecting an estimated 413,000 people, with at least 335 lives lost. The economic impact was severe, estimated to be €18 billion in storm and flood-related damages across Europe in 2024.[12]

Urban 'soil sealing', the prevalence of concrete and asphalt, prevents natural absorption. During intense cloudbursts, aged sewer systems frequently reach capacity, forcing raw sewage overflows into local water bodies.

While spring 2025 was dry, September 2025 saw extreme rainfall in Sweden, causing train derailments and washed-out roads, the most severe in decades.[13]

The European State of the Climate 2024 Report also confirms that glaciers in Scandinavia hit a record annual mass loss in 2024, exceeding all previous years, a trend that continued into 2025 due to record North Atlantic Arctic summer warmth. This rapid melting contributes to higher base levels in glacial-fed rivers, reducing the landscape's capacity to handle sudden rainfall.[14]

From flooding to 'sponge' landscapes and mobility corridors of water

The challenge of excess water, driven by extreme rainfall like the 2024 storm Boris and 2025 deluges of Mediterranean origin, is being met with a shift from 'fighting' water to 'making room' for it.
In Germany and Denmark, cities like Berlin and Copenhagen are implementing the 'sponge city' concept. By replacing asphalt with permeable surfaces and creating 'cloudburst parks' that act as temporary reservoirs during heavy rain, cities can significantly reduce the load on sewer systems, particularly during extreme rainfall events.[15]

Building on its historical success, the Netherlands and Belgium have expanded the 'Room for River' programme to the Meuse and Scheldt basins. Instead of higher dikes, they are creating controlled floodplains and 'emergency bypasses' that allow rivers to expand safely without impacting urban centers.[18]

In the UK, there is a massive move toward natural flood management, NFM. By reintroducing beavers, restoring peatlands and planting 'buffer strips' along upland streams, it is possible to slow the flow of water before it reaches downstream communities. The UK's Environmental Land Management scheme now pays farmers specifically for providing water storage services on their land.[17]

Digital modelling and assessment of extreme rainfall events, Germany:

Hydrodynamic surface runoff models are used to simulate a range of heavy rainfall scenarios. These simulations are carried out for large urban catchments as well as for smaller-scale development areas.

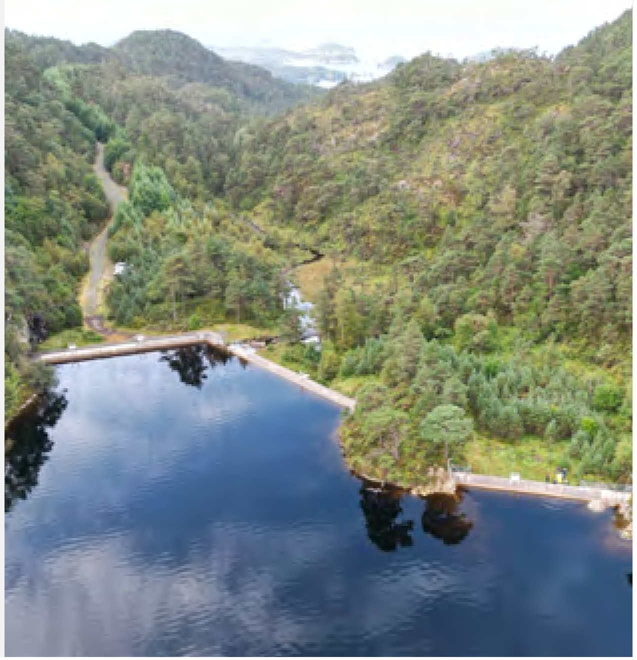
For several years, Sweco has been performing detailed modelling and assessment of extreme rainfall events to identify potential flood hazards and to develop suitable flood risk mitigation measures. Based on the modelling results, recommendations for structural and non-structural flood protection measures are identified and integrated flood risk management concepts are developed.

These analyses support urban planning processes and enable the early communication of flood risks, thereby contributing to the protection of public safety and welfare.

Critical water infrastructure: Bergen – Dam safety and flood reassessment

Sweco reassesses dams and flood conditions in two key catchments that supply drinking water to Bergen. Flood calculations were updated, dam safety reassessments were conducted, and hydrographic investigations were carried out.

The work includes technical follow-up of concrete and masonry dams and coordination of sampling and contractor activities. The project safeguards drinking water infrastructure and strengthens long-term resilience.



Excess water and flood risk – key takeaways

- **Flood risk is escalating.** Climate change is intensifying rainfall, overwhelming urban drainage and critical infrastructure, with growing impacts on public safety, mobility and economies.
- **High societal costs.** In 2024 alone, flooding affected over 400,000 people across Europe and caused approximately €18 billion in damages.
- **Cities are especially vulnerable.** Soil sealing and ageing sewer systems increase surface flooding and sewage overflows during extreme rainfall.

What´s the solution?

- **Effective solutions exist.** Sponge city concepts, room for the river approaches and natural flood management significantly reduce flood peaks and damages.
- **Proven effectiveness of nature-based and spatial solutions.** Measures such as permeable surfaces, temporary water storage areas, controlled floodplains and upstream retention have reduced sewer loads by up to 30% and avoided billions of euros in flood damages.
- **Policy implication.** Flood resilience must be embedded in land use planning, infrastructure investment and climate adaptation strategies, supported by data driven risk assessments and long term planning.

Too little:

Managing water in a changing climate

While floods dominate headlines, a silent crisis of scarcity is unfolding. Water stress now affects roughly 20% of Europe's territory and 30% of its population annually.[18]

Demand set to exceed supply

Water stress is a critical issue that manifests when the demand for water surpasses its availability during a specific period, or when poor water quality restricts its consumption. This phenomenon arises in EU countries due to various underlying factors, which can differ significantly from one region to another.

Central and Northern European countries experience water shortages primarily due to high population density, substantial industrial demand and seasonal droughts. Urbanisation leads to increased domestic water use, while industrial activities often require significant water volumes for processing and cooling. Furthermore, seasonal droughts impact water availability and exacerbate stress during dry periods.

Leakage remains a critical drain on resources. Mean values for non-revenue water, which could include leakage, water used for maintenance, street cleaning, public buildings, firefighting, etc, are around 20% of treated water, that is partially lost through ageing pipes before it reaches a tap.[4] In the UK, the Environment Agency warns of the 'jaws of death', the point where demand for water exceeds supply, occurring within the next 20 years.

Drought is also creeping further north across the globe. Sweden is experiencing localised groundwater 'poverty' in summer months. Despite their vast lakes, the shallow aquifers that supply rural households are not refilling due to warmer winters with less snowpack and higher evaporation rates.[19]

Water management in the Netherlands has traditionally focused on controlling excess water. In recent years, however, climate change has contributed to longer periods of drought, prompting a shift toward water retention, adaptive allocation and drought resilient spatial strategies.

Different measures at multiple spatial scales have been implemented across Europe to mitigate drought risk. These measures serve a range of purposes, including reducing soil subsidence, securing drinking water supplies and safeguarding ecosystems and nature preservation.

Water stress now affects roughly

20%

of Europe's territory and

30%

of its population annually.

Water stress: From scarcity to circularity

The response to water scarcity focuses on water circularity, treating every drop as a reusable asset rather than a disposable commodity.

Modern pulp and paper mills in Finland and Sweden increasingly operate with closed water loops, dramatically reducing freshwater intake. Some of the most advanced facilities recycle more than 80–90 per cent of their process water.[20]
To combat infrastructure losses, UK utilities are deploying AI-driven smart networks. Southern Water recently deployed 24,000 acoustic sensors across its 15,500 km network, reducing leakage by over 15% and saving 17 million litres a day.[21] Portsmouth Water has installed digital twins, virtual models of the pipe network, to simulate performance and proactively identify imminent bursts before they occur.[22]

In several EU countries, Sweco assists industrial clients in enhancing circularity by evaluating the use and reuse of different water sources (e.g. rain water, wastewater, process water). This comprehensive assessment, known as a water audit, focuses on identifying quick wins in water management. Each water audit is a customised exercise designed to align with the specific requirements and characteristics of the company. The result is optimised water usage, reduced operational costs, enhanced sustainability and improved overall efficiency of the company's water management.

Circular rainwater storage for drought resilience and reduced drinking water use, the Netherlands

At Agriport A7 in Middenmeer, the Netherlands, ECW Energy and Sweco have developed Waterbank Agriport, an innovative rainwater capture, storage and recovery system that strengthens drought resilience, reduces drinking water demand and secures business continuity.

Rainwater from greenhouse roofs and nearby data centres is collected, treated and stored underground in a freshwater aquifer instead of being discharged. During dry periods, the stored water is recovered and used for greenhouse irrigation and data centre cooling.

Data centres contribute large volumes of high-quality rainwater through roof runoff and require reliable cooling water supplies, while greenhouse growers need substantial volumes of irrigation water during dry periods. By linking complementary water needs and supplies, the Waterbank creates a local circular water system that reduces dependence on drinking water.

Sweco contributes water technology expertise to the system design in close collaboration with other project participants and local users. Waterbank Agriport has been operational since 11 September 2025.

Belgium’s paradoxical water stress situation

Belgium serves as a paradoxical example for water stress. Although widely recognised for its grey and wet weather—with approximately 200 days of precipitation annually—the country ranks 18th out of 25 European nations experiencing extreme water stress.

The real problem isn’t the lack of rain – it’s more about how water is managed and consumed. Especially the northern Flanders region of Belgium, characterised by a fine-meshed network of smaller waterways, has only a limited number of large watercourses that can ensure a stable water supply.

Historically, the water system in Flanders was designed for rapid drainage to mitigate flooding and protect residential areas from water damage. This design effectively managed the substantial annual rainfall, ensuring quick runoff and reducing flood risks. However, this drainage-focused approach now contrasts sharply with the evolving water demands of Flanders. The region is characterised by a dense population, intensive agriculture and substantial industrial activity, all of which place significant strain on water resources. This pressure is intensified during prolonged drought periods, which are becoming increasingly frequent due to climate change.

A strategic plan for a resilient Jersey, UK

Being an island in the English channel, the water situation is always challenged by the laws of nature. Proactive planning and preparedness is of highest priority.

Sweco has been commissioned by the government of Jersey to produce the 'Bridging Liquid Waste Strategy' report. It describes, among other things, how the use of rainwater, as well as the reuse of wastewater, can increase resilience and robustness against drought and climate change in the future.

Circular water network in Antwerp, Belgium

The City of Antwerp is increasingly affected by drought and salination due to intense urbanization and active groundwater dewatering, resulting in very low groundwater level and significant economic and ecological damage- a situation expected to worsen under current climate trends. A smart circular pipeline network has been designed by Sweco to reintroduce treated surface water into the urban landscape. Water from the nearby River Schijn is purified to remove nutrients and micropollutants, including PFAS and pesticides. The treatment facility incorporates nature-based solutions that will be integrated into the new city park. This low-grade water is then distributed via a new pressurized network to recharge the groundwater table and irrigate the urban greenery; its use as greywater for large public buildings is also being investigated.

Financed by the City of Antwerp and Blue Deal (Flemish Government)

Image: The City of Antwerp

While circular water networks help cities cope with drought by reusing available water, their success ultimately depends on the ability to remove emerging pollutants and ensure water quality suitable for reuse and environmental discharge.

Water shortage in Sweden – Is it possible?
Sweden is a country where water is usually abundant. Lakes, streams and groundwater are replenished by precipitation and, overall, Sweden has good water resources and a low risk of water stress. Yet despite this, the country has experienced water shortages.
During the summers of 2016, 2017 and 2018, large parts of Sweden faced water scarcity due to prolonged dry periods that deviated from normal rainfall patterns. Several municipalities introduced summer restrictions on municipal drinking water and water levels in many watercourses dropped significantly.

Precipitation is unevenly distributed, with western Sweden receiving more rain than the drier eastern regions, especially the Baltic Sea islands. Climate change is expected to worsen the situation by bringing longer droughts, more intense rainfall, rising temperatures and increased evaporation. Heavy rain might cause flooding rather than replenishing groundwater.

Many municipalities have developed long-term water supply plans and identified potential new water sources. However, producing high-quality water often requires advanced treatment. But technical solutions alone are not enough, consumer behaviour also plays a key role. Today, water conservation campaigns are a priority for many Swedish water and wastewater organisations.

Too little water – key takeaways

- **Demand is approaching or exceeding supply.** Water stress affects around 20% of Europe's territory and 30% of its population annually, driven by climate change, population density, industrial demand and seasonal droughts.
- **Infrastructure losses worsen scarcity.** On average, around 20% of treated water is lost as non-revenue water due to leakage and system inefficiencies, accelerating the risk of supply shortfalls.
- **Scarcity is moving north.** Countries traditionally seen as water-rich, including Sweden, are experiencing seasonal groundwater shortages due to warmer winters, reduced snowpack and higher evaporation.

What´s the solution?

- **Circular water management is essential.** Reuse, closed industrial water loops, smart leakage control and digital monitoring significantly reduce freshwater demand and increase system resilience.
- **Management matters as much as rainfall.** Belgium illustrates how drainage focused systems, dense populations and intensive land use can create severe water stress despite high precipitation.
- **Urban reuse solutions are emerging.** Circular water networks enable cities to reuse lower grade water for irrigation and public spaces, provided water quality and pollutant removal are ensured.
- **Policy implication.** Long term water security requires integrated planning that combines infrastructure renewal, advanced treatment, water reuse and demand management, alongside public engagement and behavioural change.

Too polluted:

Safeguarding the urban water quality

Urbanisation places immense pressure on water systems, often transforming them from vital resources into conduits for pollution. In urbanised regions, water contamination arises from a complex interplay of municipal and industrial discharges, agricultural runoff and ageing infrastructure. These threats degrade water quality, jeopardising public health, ecosystems and economic stability—making pollution one of the most pressing risks to urban water resilience.

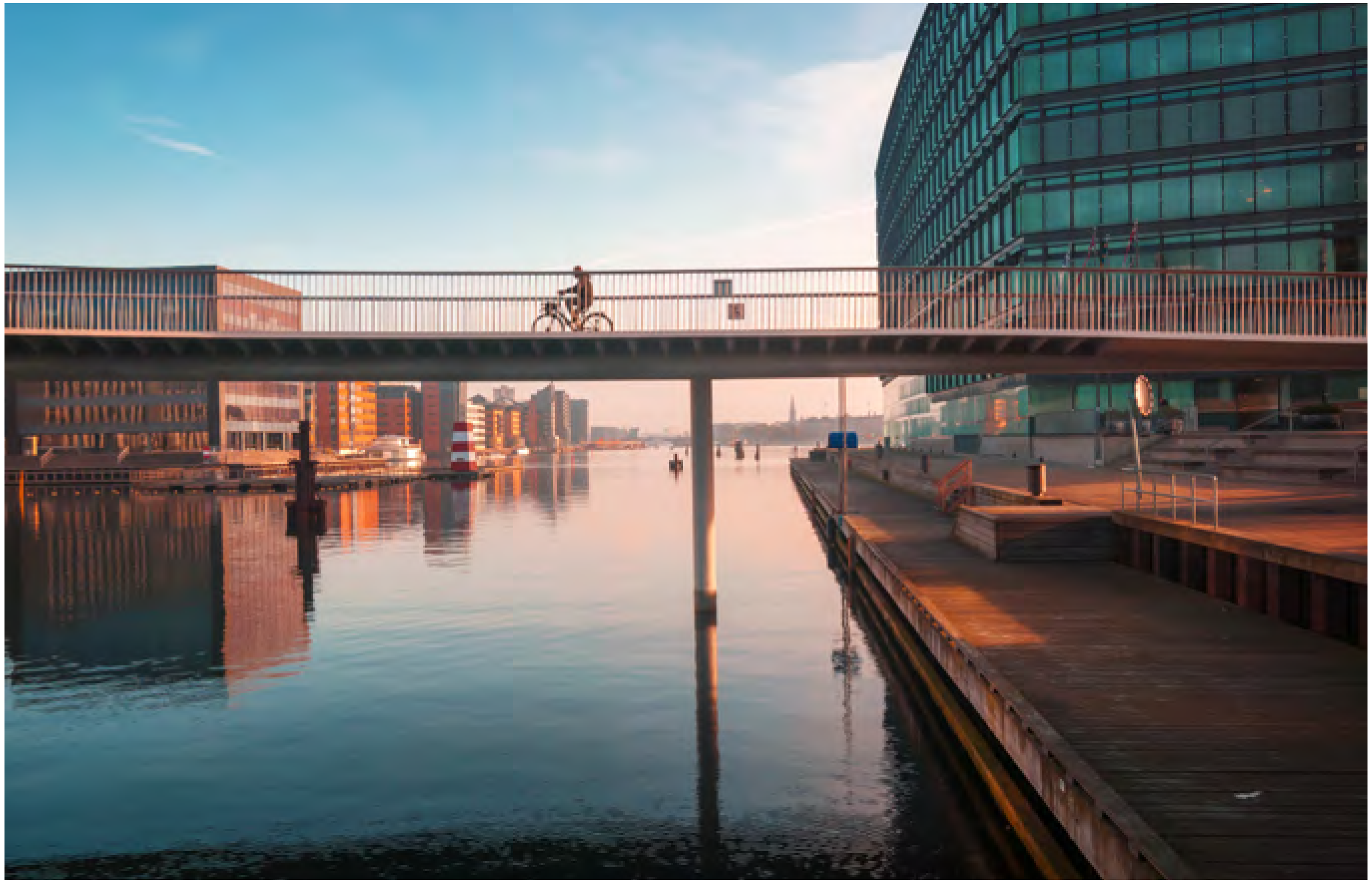
Past problems relating to heavy metals from industrial discharges or pathogens from untreated sewage are less of an issue due to the improvement measures that have been rolled out in Europe. Despite the progress, urban water systems still face severe contamination from nutrient overloads (e.g. nitrates and phosphates from agriculture and wastewater), which fuel toxic algal blooms and disrupt aquatic ecosystems.

The issue of nutrient pollution affects many regions. In countries like Poland and Lithuania, agricultural runoff—particularly nitrates and phosphorus—remains a primary source of pressure, causing massive algal blooms in the Baltic Sea and compromising local water sources.[23]

Groundwater under pressure – example from Denmark
Denmark's groundwater, its primary source of drinking water, is increasingly under pressure from pollution, climate change, rising ground-water levels and insufficient protection. Chemical contamination poses a major threat. Pesticides are found in over half of all drinking water wells and more than 300 wells have been shut down due to micropollutants.

Climate change further increases the risk of pollutants entering aquifers. Nitrate pollution from agriculture remains a long-term issue. Meanwhile, drinking water infrastructure is in critical condition, requiring significant investment. In the future, advanced but costly and energy-intensive water treatment technologies will likely become necessary, driving up both water prices and energy consumption.

> “What we once believed we had is no longer a given right.
>
> Lars Storkholm, Groundwater expert at Sweco.



The Green Tripartite Agreement (Den Grønne Trepart)
Finalised in 2024 and ramping up in 2025–2026, this DKK 40 billion agreement involves converting 250,000 hectares of farmland into nature and forest. A primary goal is to protect vulnerable aquifers from nitrate and pesticide leaching. By removing intensive agriculture from recharge zones, the project aims to secure long-term drinking water quality through source protection and reducing the future need for the costly, energy-intensive technologies needed to remove persistent substances.[24]

Drinking Water Fund (Drikkevandsfonden)
In April 2025, a DKK 206 million agreement extended this fund into 2026-2027. It finances the creation of 4,800 hectares of pesticide-free 'protection zones' around the most vulnerable drinking water wells. The fund also provides subsidies for municipalities to close old, poorly protected wells that act as pathways for micropollutants and other contaminants. This project is a key tool in the national strategy to shield the groundwater resource before pollution reaches the consumer's tap.[25]

Analysis of future wastewater treatment locations, Denmark

Sweco supported BIOFOS in planning and carrying out a long-term decision-making process relating to wastewater treatment in the capital region up to 2075. Serving around 1.2 million residents, BIOFOS operates major wastewater treatment facilities that are central to environmental protection and critical infrastructure and the project required a robust foundation for future investments and infrastructure development.

Sweco acted as the main advisor in an interdisciplinary analysis comparing three scenarios for the future of the Lynetten Wastewater Treatment Plant, assessing environmental, economic, social, technical, legal and societal impacts. The study included sustainability and climate assessments, expansion strategies and technological options.

Published in December 2025, the analysis provides a solid basis for strategic decisions on future wastewater treatment by BIOFOS.

What is toxic stress?

Toxicity stress is a measure of the negative effects experienced by the aquatic system due to chemicals and mixtures of chemicals that are transported through and accumulate in freshwater ecosystems and negatively affect the aquatic ecosystem. It arises when multiple chemicals—such as pesticides, pharmaceuticals, industrial chemicals and other pollutants—are present simultaneously, even if individual substances are below regulatory thresholds. Together, these mixtures can impair organism health, reduce reproduction and growth, cause species loss and ultimately alter ecosystem structure and biodiversity.[26]

While well-known pollutants have long been recognised as threats to urban water quality, advancing scientific research and montoring techniques exposed a new wave of emerging contaminants, often referred to as micropollutants. They are basically the residues of some industrial products, which can cause an environmental impact, even at very low concentrations. Micropollutants have been an issue of concern for the last two decades in Europe, and their presence creates systemic risks for water quality and aquatic ecosystems.

Among micropollutants, one group stands out as particularly persistent threat to drinking water supplies: per- and polyfluoroalkyl substances (PFAS), often called 'forever chemicals'. These compounds pose a significant water quality challenge across Europe. To remediate all PFAS over the next 20 years, the cost in Europe is estimated to be close to € 2 trillion.[27] Quantifiable annual health costs from human exposure to PFAS-related chemicals in the European Economic Area has been estimated at EUR 39.5 billion per year.[27]

Currently, only 37% of Europe's surface water bodies achieve a good or high ecological status, while 29% meet good chemical status. According to the European Environment Agency (EEA), 32% of Europe's groundwater faces pressure from diffuse pollution, primarily from agriculture.[18]

The silent spread: Micropollutants in our water

Increasing urbanisation and industrialisation, steady developments in chemical synthesis techniques and improving analytical methods resulted in the awareness of emerging contaminants in water in the last decades. Today so called micropollutants can be detected in almost every environmental matrix such as water, atmosphere or soil.

There is no universally accepted definition of micropollutants, but the term is generally used for human-made chemicals that can harm the environment at very low concentrations. Unlike known macro-pollutants such as nutrients, they are often persistent, costly to monitor and difficult to remove due to their diverse properties.

Micropollutants, largely composed of industrial chemicals, pharmaceuticals and household products, enter our water bodies through various pathways. Figure 4 gives an overview of these pathways.

Given that existing mechanical-biological wastewater treatment systems in Europe were designed at a time when micropollutants were not yet recognised as an environmental threat, municipal wastewater treatment plants (WWTPs) have become the primary pathway for their release into aquatic environments.

Agricultural areas serve as major non-point sources of veterinary pharmaceuticals and pesticides; however, controlling these contaminants through technical measures remains particularly challenging.

While medical facilities such as hospitals and clinics are identified as significant point sources for specific pharmaceutical residues, the majority of medicines are consumed in households. Due to the combined input from households, industries and diffuse sources—all converging in municipal sewer networks—WWTPs function as critical hotspots for the discharge of a wide range of micropollutants into aquatic systems. Since conventional WWTPs were not designed to eliminate these substances, they frequently pass through treatment processes largely unchanged, resulting in their widespread environmental release. That is why the extension of municipal wastewater treatment is an intensively discussed topic.

> “ The dose does not always make the poison.
>
> Demet Antakyali, Wastewater treatment expert at Sweco.

From source to tap – and back to nature

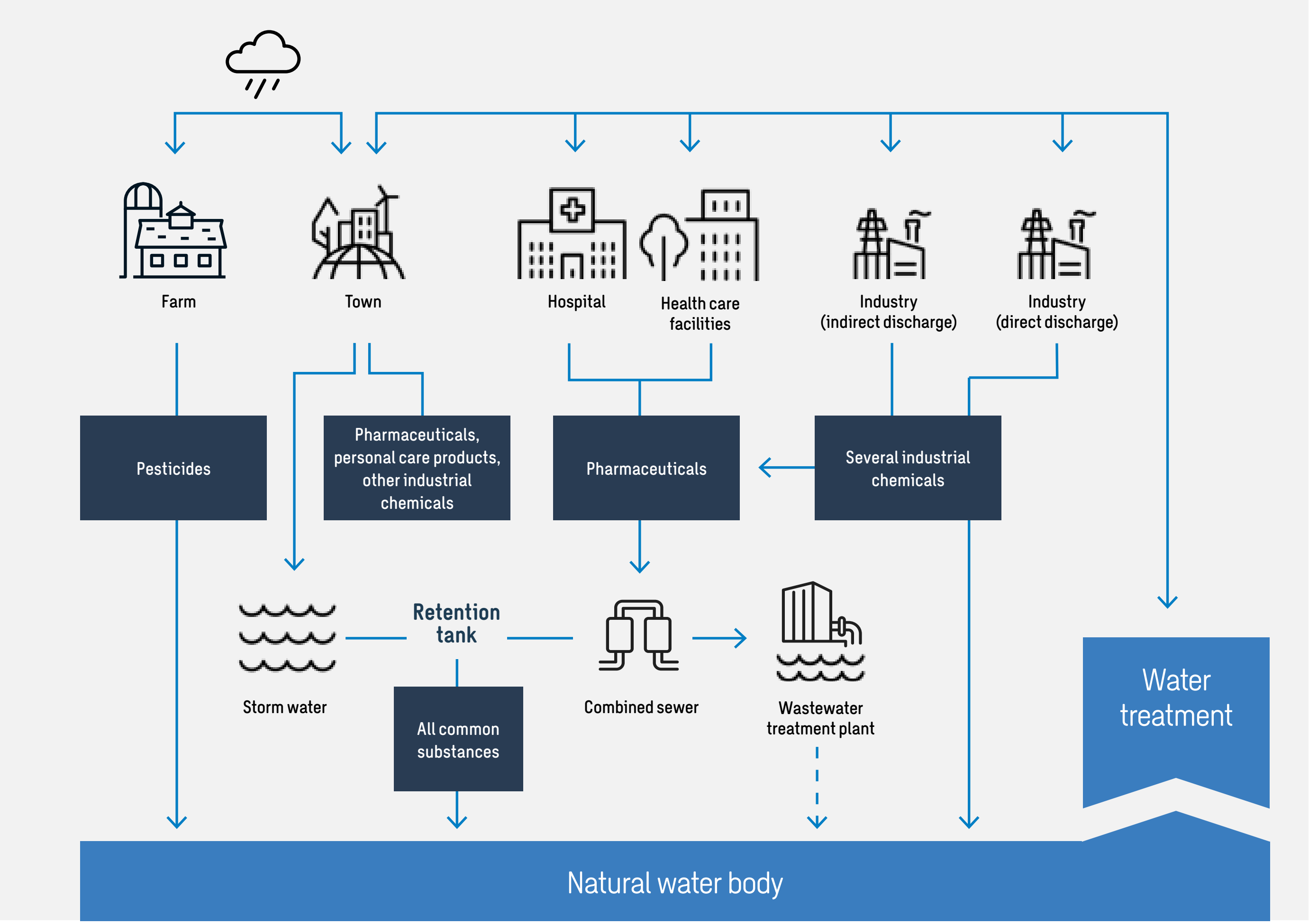


Figure 4: Different pathways of micropollutants entering the environment (Antakyali et al., 2015)

From pollution to source-control and advanced treatment

Addressing degraded water quality has shifted from simple 'end-of-pipe' treatment to a 'source-to-tap' protection strategy, which targets pollution prevention through a multiple-barrier approach. This holistic framework integrates measures at every stage of the water cycle—from source protection and catchment management to advanced treatment and distribution system resilience. By prioritising proactive interventions, such as reducing pollutant discharges at the source, the strategy aims to minimise contamination risks before they reach treatment facilities. The multiple-barrier approach further strengthens safeguards by combining regulatory controls, monitoring and technological innovations to ensure water safety from watershed to consumer.

Micropollutant removal

Applied research at the beginning of the 2000s showed significant elimination of micropollutants through oxidative, adsorptive and physical processes. Work carried out in recent decades proved that ozonation and activated carbon adsorption were economically feasible options. Quaternary treatment plants have already been built in Europe, particularly in Germany and Switzerland. Significant developments have also taken place in the Netherlands, Belgium and Sweden, and the first plants have either been created or are soon to be built.

The problems caused by these new types of pollutant chemicals have led authorities to amend their regulations. The Urban Wastewater Directive and the Drinking Water Directive now include new requirements.

Micropollutant removal in Warburg – From untapped capacity to future proof treatment

In Warburg, Germany, Sweco provided technical support to the municipality to determine what the optimal quaternary treatment approach to micropollutant elimination was, as adapted to the facility's operational demands and site-specific conditions.

At the time of the project, the WWTP served a diverse catchment that includes a sugar refinery, a brewery and a hospital, all contributing complex wastewater streams. Sweco first carried out a feasibility study, systematically comparing advanced treatment options to identify the most suitable and cost-effective solution. Based on the results, an ozonation process including a biological post-treatment step was selected. Sweco then designed the ozone treat-ment stage and prepared the successful application for public funding, helping secure the project's financial viability.

In 2017, following constuction, Sweco continued its involvement during startup and operational optimisation, ensuring stable and efficient performance. Later, an applied research project was conducted generating valuable operational insights for future projects.

Micropollutant Treatment Plant in Flanders, Belgium

Flanders has launched its first full-scale quaternary treatment installation, marking a breakthrough in removing persistent s such as pharmaceuticals, pesticides, hormone-disrupting compounds and PFAS from wastewater. At Aquafin's WWTP located in Aartselaar, the new line combines disc filtration, high-capacity ozonation and granular activated carbon filtration to treat up to 1,200 m³ of effluent per hour. The project strengthens local water quality—particularly in the Grote Struisbeek—and provides essential insights for future applications across Flanders and beyond. This higher-quality effluent also paves the way for broader water reuse opportunities in the future.

Sweco carried out the feasibility study, design, permitting, tendering and construction support across all engineering disciplines. The installation was built in collaboration with Aquafin, Deckx, Xylem/Wedeco, Mols and Litran and forms part of the Interreg initiative. The facility was officially inaugurated on 23 May 2025 and serves as a pilot for future advanced treatments in Flanders.

Images by Frederik Beyens – Aquafin

Focus on drinking water: Managing PFAS

Among the emerging contaminants, the group of per- and polyflu-oroalkyl substances, PFAS, also known as forever chemicals, are very persistent and threaten water quality and food sources. These substances are extremely stable and resistant to biological and chemical degradation. The substance group comprises thousands of individual chemicals - partly with different physical-chemical properties - of which 20 to 50 are considered as relevant for water pollution. Known contaminated sites in Europe are shown in figure 5.

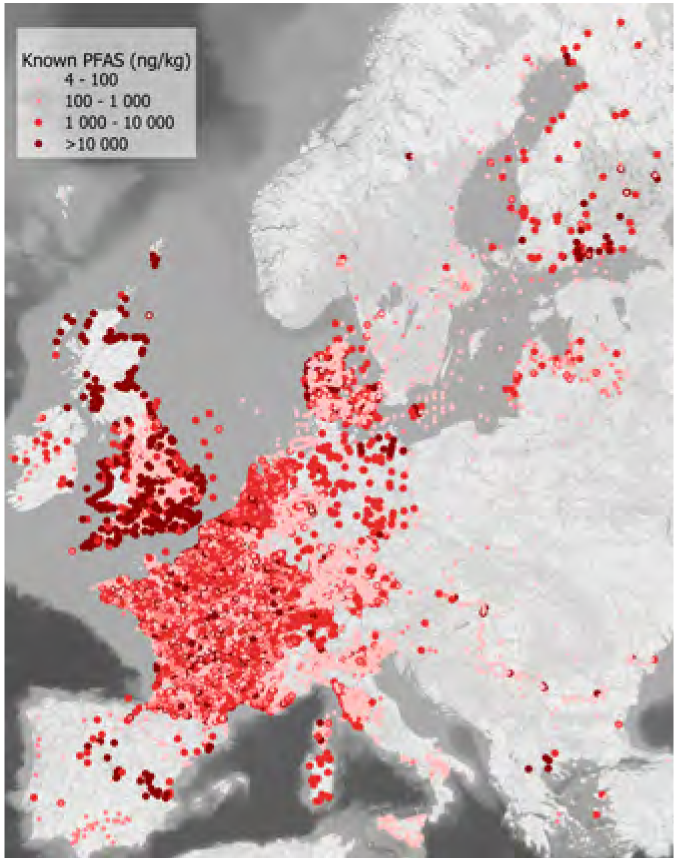


Figure 5. Known contamination sites with PFAS in Europe
(Source: European Environment Agency)

Growing concern exists among the government the public as these chemicals reach water supplies, posing significant health risks.

To address PFAS in drinking water, the most common technology is adsorption via activated carbon and ion exchange resins. Yet the efficiency of the removal depends on the type of individual substances, since the removability of single substances differ.

Regarding micropollutants, the technical and economic challenges and possible prevention at the source must be addressed before removal techniques can be widely used. To avoid further deterioration of water quality, chemical releases into water bodies should be minimised.

Plant-level costs of micropollutant removal

The costs for micropollutant treatment vary depending on the method used, existing assets, substances and flow to be treated. Additionally, removal costs are highly site-specific and depend heavily on the chosen technology, local conditions and plant size. Although the absolute costs for larger plants are higher, the specific costs per capita or per m³ treated wastewater decrease with the increasing plant size.

The evaluation of total annual costs according to the annuity method including the capex and opex for some of the plants implemented in Germany, assuming a life cycle of 30 years for civil works, 15 years for machinery and 10 years for electrical engineering for capital costs, indicate that annual costs for mid-size plants (about 50.000 population equivalents) vary between 0,10-0.20 €/m³ treated wastewater.

In Sweden, the first full-scale ozonation plant for removing micropollutants in wastewater has operated since 2017 and was designed for 216 000 population equivalents with an investment cost of 2.5M€. A small-scale treatment plant for 15 000 population equivalents, using ozonation and activated carbon, was built in 2020 for around 1,3 M€. The cost of removing micropollutants from wastewater is highly site-specific and depends heavily on the technology, removal efficiency and plant size. Upgrading smaller plants are generally more expensive.

What is PFAS?

PFAS (per- and polyfluoroalkyl substances) are human-made 'forever chemicals' that have been used since the 1950s for their water-, dirt- and grease-repellent properties in products such as cosmetics, waterproof clothing, food packaging and firefighting foam. They break down very slowly, spread globally and accumulate in nature and in our bodies. The PFAS group includes thousands of substances, many of which are still poorly studied. While some PFAS are known to be toxic and linked to serious health and environmental risks, the effects of many others remain uncertain. In addition, when PFAS are measured, only a limited subset of these substances is typically analysed, making it difficult to fully assess actual concentrations and risks. As a result, millions of Europeans may be exposed to PFAS through drinking water without the full extent of the exposure being known.[28]

Evolution of the EU Water Framework

Several European policies including the Water Framework Directive (WFD), Floods Directive (FD), Nitrates Directive (ND), Urban Wastewater Directive (UWWTD), Drinking Water Directive (DWD) and Bathing Water Directive regulate pollution prevention by ensuring freshwater availability and safeguarding water use and discharge. A recast version of the UWWTD was formally agreed by the European Parliament and Council in 2024, entering into force on 1 January 2025.

The EU's Drinking Water Directive (DWD) strengthens the standard for drinking water from conventional end-of-pipe monitoring to a more holistic approach covering the entire water supply chain. The recast directive updated quality standards, expanded monitoring for contaminants such as microplastics and endocrine disruptors and included obligations for water utilities and municipalities to improve access to safe drinking water for all, including vulnerable groups.

Recent developments include new EU rules for systematic PFAS monitoring in drinking water, effective January 2026, setting a limit value for PFAS mandatory for EU Member States since 12 January 2026.[30]

The EU Urban Wastewater Treatment Directive, UWWTD has, since its adoption in 1991, played a significant role in pollution reduction, as well as the improvement of water quality and contributed to the standardisation of wastewater treatment methods in member states and the protection of sensitive areas. In 2024, the EU updated the UWWTD to meet the overall sustainable developments goals in terms of water quality. The new directive brought in quite a few changes, such as strengthening of the limit values, energy neutrality in WWTPs and the quaternary treatment.

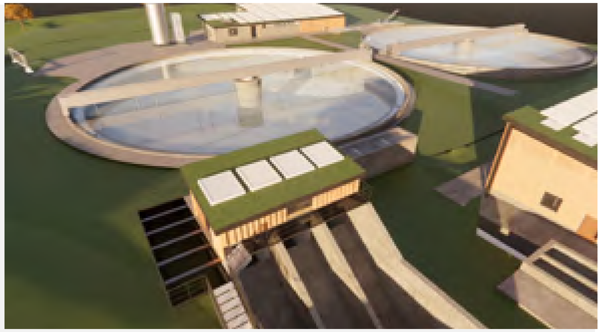
Large plants are required to use quaternary treatment and, depending on a local risk assessment, this requirement can also apply to plants above 10.000 PE. If a local assessment is not available, then it must be assumed that its outcome would have been negative and a quaternary treatment stage will be required.

The transposition of the directive into national legislation might differ in detail, but it is already clear that a large number of WWTPs within the EU will need to implement a quaternary treatment stage either immediately or in the near future. Operators of wastewater treatment facilities must recognise this need and, ideally, act at an early stage, for example through feasibility studies.

Turning wastewater into power, the journey to energy neutrality, Germany

A compelling example of the possibilities available to reach energy neutrality or even autarky in wastewater treatment is the WWTP in Balingen, southern Germany. The plant leverages multiple energy recovery and production methods, including the electrification of digester gas, photovoltaic panels and solar sludge drying. Even the head difference between the discharge point and the receiving water body is harnessed via a small water turbine. Sweco has been advising the operator for years in several fields and is currently exploring further options to optimise the energy balance, such as expanding photovoltaic capacity or utilising wastewater heat through a heat pump.

Photographer: Måns Berg



Too polluted – key takeaways

- Urban water quality is threatened by combined pressures from municipal and industrial discharges, agricultural runoff and ageing infrastructure.
- Groundwater resources in several countries are under increasing pressure from pesticides, nitrate pollution and insufficient protection.
- Emerging micropollutants, including PFAS, pharmaceuticals and industrial chemicals, are now detected in most water bodies and are difficult and costly to remove.
- Only a minority of Europe's surface waters and groundwater bodies currently achieve good ecological or chemical status, underscoring the scale of the pollution challenge.

What´s the solution?

- Integrate catchment-based source protection into land use and urban planning around water resources.
- Prioritise source-directed measures to reduce the release of PFAS and other micropollutants into water bodies.
- Strengthen product and emission regulations, including extended producer responsibility for harmful substances.
- Optimise existing infrastructure, both technically and energetically
- Plan and finance the implementation of quaternary treatment in order to meet the requirements of the European directives.

The price of purity according to a Sweco study

Water services—drinking water supply, wastewater treatment and often stormwater management—are essential for public health, environmental protection and economic activity in Europe. While the EU sets common environmental and health standards, each country is responsible for organising and financing its own water services. As a result, governance models differ widely, ranging from fully public management to private or mixed operations.

Most water infrastructure in Europe is publicly owned. Water tariffs are the main way to cover costs, although the balance between tariffs, taxes and public transfers varies between countries. Tariffs usually include both fixed and usage-based components to ensure stable funding. Depending on the countries, it can also also include investments needed to maintain ageing infrastructure, adapt to climate change and address new challenges such as micropollutants. Understanding these costs is key to keeping water services both affordable and reliable in the long term.

The analysis by Sweco is based on a review and synthesis of publicly available data, notably a 2021 survey by the European Federation of National Associations of Water Services (EurEau), which covers the situation in 29 EurEau member countries[10]. Sweco used its experience from micropollutant removal in Germany, applied it to EurEau's cost data, and derived a rough estimate of the resulting water price increase in Europe—driven by expanded wastewater treatment for micropollutant removal.

The survey by EurEau provides an overview of drinking water and wastewater networks, as well as average consumption and pricing. Reported average prices include charges for drinking water supply, sewerage, wastewater treatment, additional supplier fees and taxes.

Regarding the infrastructure large differences are seen across Europe. Drinking water network length ranges from 4.4 to 19.6 meters per capita, with an average of 8.6 meters. Wastewater networks show a similar disparity, spanning 2.2 to 11.5 meters per capita, with an average of 6,7 meters per capita.

Water use and prices also vary widely. Average household consumption is 125 litres per person per day. Water prices range from about €1.2 per cubic metre in Bulgaria to €9.3 in Denmark, with a European average of around €3.6 per cubic metre.

The price of wastewater treatment

Assuming an additional annual cost of €0.20/m³ for implementing quaternary treatment, average water usage, and full return to the sewer (with around 10 % infiltration), the expected cost increase for domestic use due to quaternary treatment is approximately 6 %. This would raise the average price to €3.8. Countries with currently low water prices are likely to experience this increase more significantly.

The distribution of costs among drinking water supply, sewerage and wastewater treatment differs by country. However, a statistical tool by the International Water Association (IWA) suggests that roughly half of the total costs are attributed to wastewater treatment.[31]

6%

Increase in cost for domestic water supply if advanced wastewater treatment is added.

50%

of the total costs are attributed to wastewater treatment.

Reflection and conclusion:

The true cost of water

Water, an essential resource for all life, has historically been undervalued due to its abundant supply in many regions. However, the true costs of water usage—particularly for drinking water and the release of treated wastewater—extend far beyond mere monetary values and encompass various non-measurable costs. These include environmental degradation, economic imbalance due to resource competition and the loss of potential alternative uses of water, all of which can significantly impact ecosystems and biodiversity.

This gap between price and value leads to underinvestment in water efficiency and management, even as water scarcity and dependency risks continue to grow. Understanding the true cost of water is, therefore, crucial for resilient economies and sustainable decision-making.

Human health is highly dependent on the availability of clean fresh water and controlled collection and treatment of wastewater. Many economic sectors, such as the agricultural, food and energy sectors, are not able to produce valuable goods and services without water. Paradoxically, in many societies, water is affordable, precisely because it is so crucial. Access to clean water is recognised as a universal human right and this is one reason why water prices tend to be regulated or controlled by governments. In Ireland, for instance, water is costless.

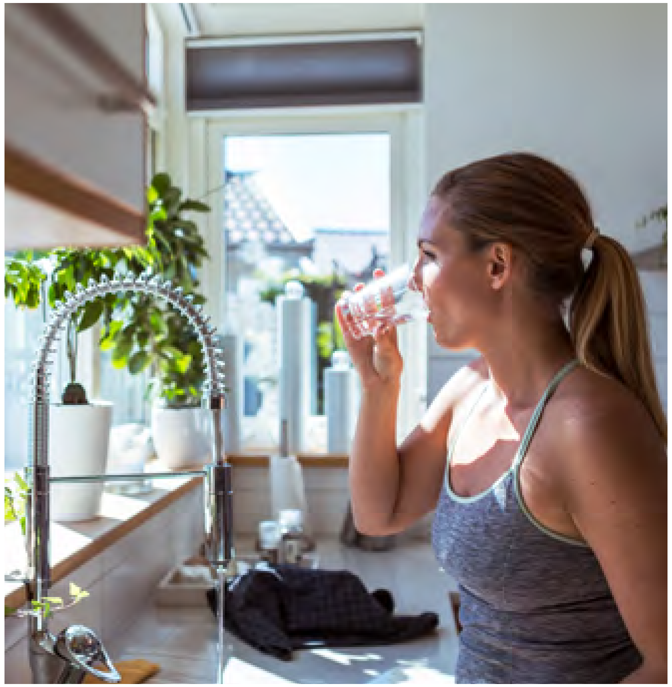
This situation might mistakenly result in investments in water efficiency and water management being given a low priority—especially in business and economic contexts.

The chart below shows the price of water relative to household disposable income in some European countries. In Ireland, domestic water has been provided free of charge for primary residences since 2017 under the Water Conservation Grant policy. In the Netherlands and Austria, the price of water remains relatively low compared to other countries.

In the past decades, the limited need for investment and operational improvements have enabled Dutch water suppliers to maintain low water prices. This is why water has become cheaper relative to other goods and services. In 2022, households paid a price that was 22% lower than in 1997 (in real terms). Industrial water users paid 14% less compared to 2017.

However, water prices started to increase in 2023, with households and industrial users paying 14%-15% more. Water prices for 2024 have been increased by another 9% for households and 15% for industrial users.

The variation between the lowest and highest water prices within countries illustrates that water pricing is shaped as much by local conditions and governance choices as by the effort needed to deliver the required volumes and quality. Countries with low minimum prices often benefit from historical infrastructure and abundant resources, but might face challenges in financing future resilience. Conversely, higher prices—such as those observed in Denmark—reflect full cost recovery, strong environmental protection and the deliberate use of pricing as a tool to promote efficiency and sustainability. These differences underline that water prices are not merely a cost to households, but a policy instrument that signals how societies value water and prepare for future risk.



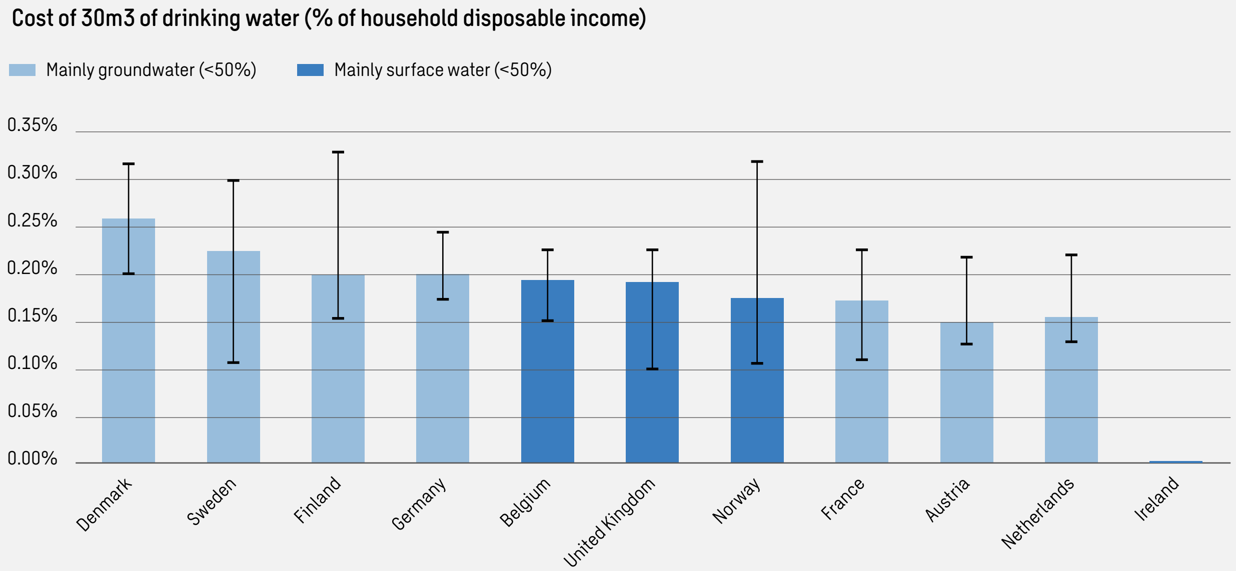


Figure 6: Price of water relative to household disposable income. Source: RaboResearch based on World Bank, OECD and EurEau.

Determining the true cost of water

To understand the true cost of water, it is essential to look beyond the financial charges shown on household or industrial water bills. While direct costs—those visible on the water bill—are necessary to cover abstraction, treatment, distribution and wastewater handling, they typically represent only a fraction of the full cost of water use.

Current pricing structures rarely account for the broader benefits of safe and reliable freshwater to public health. Nor do they reflect the fundamental value of naturally available, high-quality water as a part of everyday consumer products or as a critical resource for industries such as chemicals, paper and pharmaceuticals. Furthermore, water prices seldom reflect the environmental consequences of human activities, including wastewater discharges, cooling water releases, nutrient leaching and emissions of micropollutants. Equally absent is the cost of future risk: the growing likelihood that sufficient quantities of high quality freshwater might not be available in the short or long term.[32]

In this sense, the true cost of water includes both what it takes to deliver water today and what society and nature pay over time as a consequence of how water is sourced, used and discharged.

Competition for water resources

As populations grow and industrial activities expand, competition for water resources is intensifying. Groundwater, in particular, is under increasing pressure from industrial processes and cooling demands, alongside agricultural use and expanding urban infrastructure.
This competition often leads to over extraction, disrupting natural recharge cycles and reducing water availability for ecosystems and other users.

In regions already affected by water scarcity, such pressures can have significant socio-economic consequences, exacerbating inequalities and increasing tensions between competing user groups. Water scarcity thus becomes not only an environmental challenge, but also a social and economic one.

Alternative uses

When water is predominantly allocated to drinking water supply and industrial production, many beneficial alternative uses are overlooked. Water that could support agricultural irrigation or sustain wetlands—critical components of healthy ecosystems—is often diverted away from these functions. Such alternative uses play a vital role in maintaining biodiversity and supporting food security.
The absence of water for these purposes can result in habitat loss, declining agricultural productivity and the degradation of ecosystem services that underpin human well-being. These missed opportunities represent an often hidden cost of current water allocation practices.

> The true cost of water extends far beyond the water bill, encompassing economic, environmental, social and climate related costs borne by society and nature, now and in the future. Because water has no borders, these costs and impacts are shared across regions and generations.
>
> Mattias Salomonsson, Water Expert at Sweco

Ecosystem services and biodiversity impact
The extraction and consumption of water for human use directly affects ecosystem services—the benefits people derive from functioning natural systems. These include flood regulation, carbon storage and habitat provision for countless species.

When water bodies are depleted or polluted, these functions are weakened or lost entirely. Over time, cumulative impacts can lead to ecosystem degradation or collapse, with far reaching consequences for biodiversity, human health and livelihoods. Such losses are rarely reflected in water pricing, yet they constitute a substantial part of water's true cost.

Environmental degradation from wastewater discharge
Polluted or insufficiently treated wastewater discharged into the environment poses serious risks to aquatic ecosystems and drinking water sources. Upgrading wastewater treatment plants and improving the management of water infrastructure are, therefore, critical to reducing pollution loads and preventing sewer overflow.

Failure to address these issues increases long term environmental damage and raises future treatment costs, transforming today's savings into tomorrow's liabilities.

The need for sustainable water management
Addressing the true cost of water requires a fundamental shift towards sustainable water management practices. This includes reducing water consumption, increasing reuse and improving treatment quality through advanced technologies. Circular water strategies can reduce pressure on natural resources while enhancing system resilience and ecosystem health.

Understanding the true cost of water means acknowledging the hidden and often non-measurable costs associated with its use. By prioritising sustainability and conservation, it is possible to balance human needs with environmental protection and to build resilient urban and regional water systems.

From cost to risk: A broader perspective
The calculated cost of water infrastructure tells us what we pay to capture, treat, store and deliver each cubic metre of water. This information is essential for planning and investment—but it represents only part of the picture. Once infrastructure is in place, a different set of questions emerges: What is the cost when water is unavailable, insufficiently clean, or arrives all at once in the form of floods? What is the cost of locking future generations into today's design choices, or of degrading the ecosystems that sustain the water cycle itself? The true cost of water is, therefore, not merely a matter of euros per cubic metre, but of the risks embedded in every decision about water management. Droughts, floods, supply disruptions, tightening regulations, reputational damage and ecosystem degradation all translate into tangible financial and operational risks for utilities, industries, municipalities and society at large.

By shifting the discussion from 'How much does water cost today?' to 'What risks are we carrying into the future because of the way that we manage water now?', the true cost of water becomes a framework for understanding long term value, resilience and responsibility. Examining physical, regulatory, financial and social risks across the entire water cycle reveals that understanding water's true cost is fundamentally about risk exposure, risk allocation and risk reduction—and ultimately about defining what responsible water management truly means.

Recommendations

Europe's water systems are facing a structural mismatch between rising expectations of water availability and quality and the realities of climate volatility, pollution, security risks and aging infrastructure. Even in regions with historically reliable water systems, climate change, emerging pollutants such as micropollutants, growing demand and underinvestment are increasing pressure on drinking water sources, treatment capacity and distribution networks.

Sweco's analysis shows that while Europe's water services are generally well developed, significant differences in infrastructure, pricing and cost structures remain. Future investment needs—driven by ageing assets, climate adaptation and stricter treatment requirements—are likely to increase across most countries. This underlines the importance of transparent cost recovery mechanisms, long-term investment planning and policy choices that balance affordability with the need to maintain resilient and high-quality water services.

A key finding is the growing risk–response gap in managing PFAS and other micropollutants in Europe's water sector. Although EU legislation is becoming more stringent and effective treatment technologies exist, implementation is uneven and highly site-specific. Smaller utilities, in particular, face higher unit costs and limited technical capacity.

At the same time, current water tariffs often do not fully reflect the long-term investments required for advanced treatment, addressing ageing infrastructure dealing with renewal and emerging contaminants and funding improved monitoring. This mismatch risks delaying necessary upgrades and underestimating actual exposure to PFAS and harmful substances, given current limitations in monitoring.

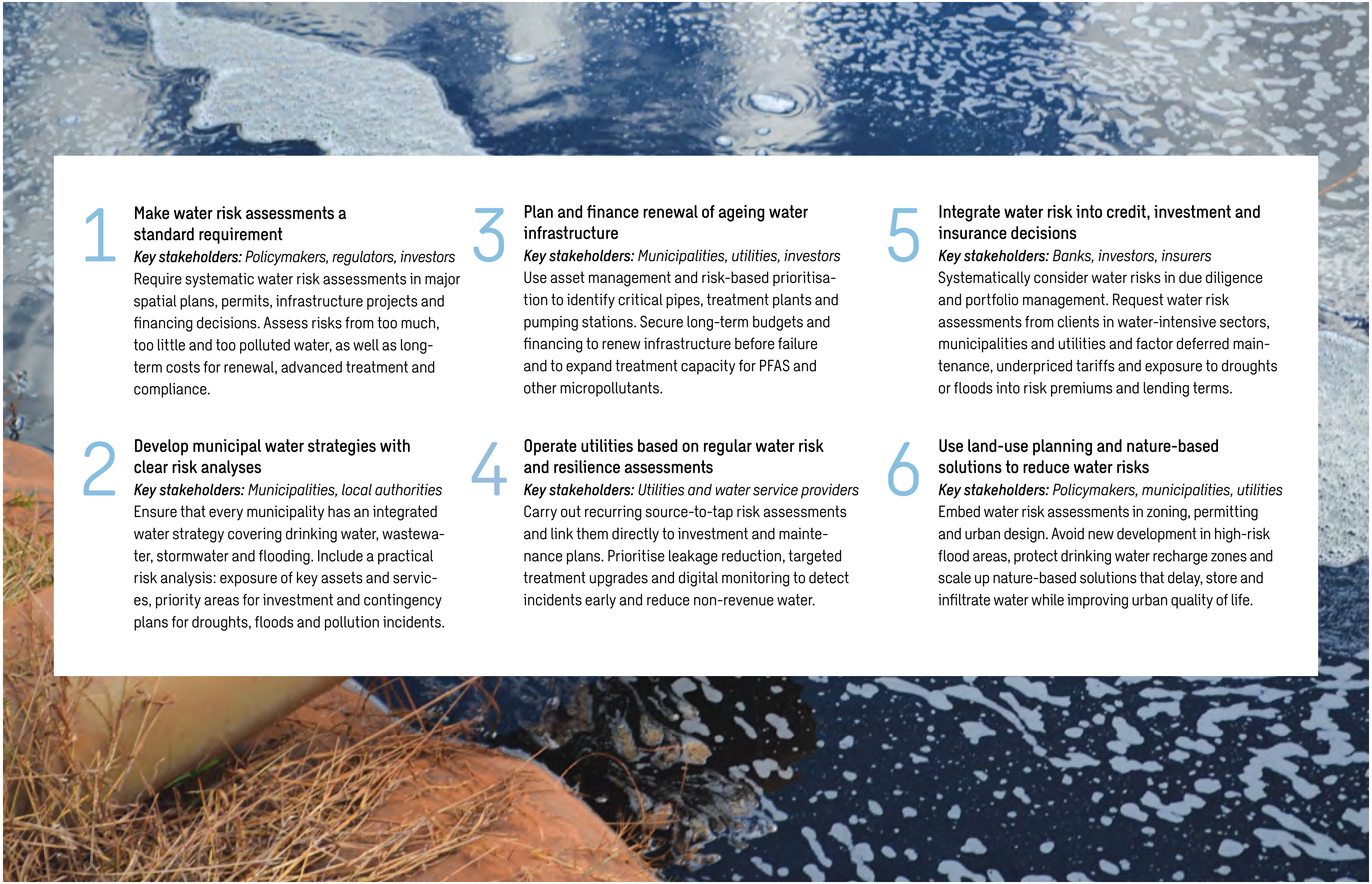
Bridging this gap will require early planning, risk-based prioritisation and financing strategies that align policy objectives with practical and economic realities. Based on Sweco's experience across Europe, several key actions are needed to secure resilient water systems in the decades ahead.

These recommendations are directed at four key groups, each with a distinct role in managing water risks.

- Policymakers set the overall rules, incentives and funding frameworks.
- Regional authorities and municipalities translate these into local water strategies, land-use decisions and budgets.
- Utilities companies are responsible for day-to-day delivery, risk management and renewal of water infrastructure.
- Banks and investors price water-related risks into lending and investment decisions and can accelerate or delay the transition to more resilient water systems.

The growing gap between the true cost of water and its regulated price should not be interpreted as a call to increase water tariffs or limit access to a basic human right. Instead, it highlights the urgent need for a justified decision-making methodology that supports strategic investments in water infrastructure and management systems. Much of today's drinking water and wastewater infrastructure was designed for past challenges and is no longer sufficient to address emerging risks such as micropollutants, climate change and increasing demands on water resources.

To safeguard human health, ecosystems and long-term economic resilience, societies must prioritise investments in modern water treatment technologies, upgraded infrastructure and integrated water management. Recognising the true cost of water is, therefore, essential, to make water more expensive for users, but to ensure that water systems are robust, future proof and capable of delivering safe water for generations to come.



1

Make water risk assessments a standard requirement

Key stakeholders: *Policymakers, regulators, investors*
Require systematic water risk assessments in major spatial plans, permits, infrastructure projects and financing decisions. Assess risks from too much, too little and too polluted water, as well as long-term costs for renewal, advanced treatment and compliance.

2

Develop municipal water strategies with clear risk analyses

Key stakeholders: *Municipalities, local authorities*
Ensure that every municipality has an integrated water strategy covering drinking water, wastewater, stormwater and flooding. Include a practical risk analysis: exposure of key assets and services, priority areas for investment and contingency plans for droughts, floods and pollution incidents.

3

Plan and finance renewal of ageing water infrastructure

Key stakeholders: *Municipalities, utilities, investors*
Use asset management and risk-based prioritisation to identify critical pipes, treatment plants and pumping stations. Secure long-term budgets and financing to renew infrastructure before failure and to expand treatment capacity for PFAS and other micropollutants.

4

Operate utilities based on regular water risk and resilience assessments

Key stakeholders: *Utilities and water service providers*
Carry out recurring source-to-tap risk assessments and link them directly to investment and maintenance plans. Prioritise leakage reduction, targeted treatment upgrades and digital monitoring to detect incidents early and reduce non-revenue water.

5

Integrate water risk into credit, investment and insurance decisions

Key stakeholders: *Banks, investors, insurers*
Systematically consider water risks in due diligence and portfolio management. Request water risk assessments from clients in water-intensive sectors, municipalities and utilities and factor deferred maintenance, underpriced tariffs and exposure to droughts or floods into risk premiums and lending terms.

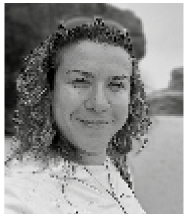
6

Use land-use planning and nature-based solutions to reduce water risks

Key stakeholders: *Policymakers, municipalities, utilities*
Embed water risk assessments in zoning, permitting and urban design. Avoid new development in high-risk flood areas, protect drinking water recharge zones and scale up nature-based solutions that delay, store and infiltrate water while improving urban quality of life.

About the authors

Feel free to contact us with your questions and thoughts. E-mail: urbaninsight@swecogroup.com



Demet Antakyali is a Team Lead in environmental business consulting at Sweco and has degrees in Environmental Engineering from Izmir and Water Resources Engineering and Management from Stuttgart. During her academic work as scientific staff at the University of Stuttgart, she obtained her doctorate of engineering with a thesis on decentralised water, wastewater and energy infrastructure. Between 2014 and 2018, she led the Competence Center for Micropollutants NRW, one of three regional expert groups on micropollutants in Europe at that time, where Sweco was involved in a consortium. Demet currently works as a wastewater treatment process engineer, project manager and team lead in environmental business consulting. Since 2025, she also holds a certificate in hydrogen technologies.

Toon Boonekamp is Senior Consultant Water Technology and Energy at Sweco. He is a process engineer by education and followed additional training on wastewater treatment technology at the Dutch Foundation for Higher Professional Water Education. He has over 30 years of consultancy experience within the water technology sector. Toon prefers to operate within the three technical dimensions of sustainability: water - energy - resources. He believes that sustainable operations start with understanding the impact and operational boundaries of ones activities. Through practical case studies on alternative water use, treatment systems, and energy solutions, opportunities for more sustainable operations can be identified and implemented in collaboration with local communities and neighbouring companies, helping to secure a long-term licence to operate.

Gerly Hey is a Senior Water and Wastewater Analyst at Sweco. She is an educated process engineer with over 20 years of experience within water treatment including cost estimations for treatment plants. She holds a PhD degree in Water and Environmental Engineering and has worked with the advanced treatment of organic micropollutants in water. Gerly has expertise in treatment of micropollutants in water and cost estimations for different types of wastewater treatment plants and drinking water facilities.

Mattias Salomonsson is Research and Development Manager for Water in Sweco. He holds a MSc in Water and Environmental Engineering. He has ten years of experience working at a water and wastewater utility before joining Sweco as a consultant. Mattias works across the entire water and wastewater sector. In recent years, his work has focused heavily on climate adaptation measures and strategic water and wastewater issues. He has been responsible for the development of several national policy documents and guidelines related to climate adaptation in Sweden and is a well-known speaker and moderator at conferences within the water sector.

Lars Storkholm is a Team Manager in Sweco Denmark's environmental department and holds a MSc in Geology. He has over 25 years of experience in soil and groundwater projects within economics, field investigations, groundwater explorations and mapping, hydrogeology and pumping tests, risk assessments of hazardous substances in both soil and groundwater among other things.

Noémi Van Bogaert is a Project Manager with a strong interest in the interplay between nature, agriculture and society and with particular expertise in water. After completing her MSc in Environmental Sanitation and Management, she pursued a PhD at the Faculty of Bioscience Engineering at Ghent University. Following her doctoral studies, she further honed her expertise by conducting post-doctoral research on aquatic viruses in the United States. As a scientific advisor for the Belgian agri-food industry, Noémi tackled various environmental challenges, emphasising the enhancement of water quality and availability through sustainable farming practices. At Sweco, she leverages her extensive experience to promote the development of a sustainable and resilient society.

Contributing experts at Sweco:

- Annelies Beuckels, Water Expert at Sweco.
- Simon Mort, Head of Engineering Water at Sweco.
- Susanne Tettinger, Water Specialist at Sweco.
- Kerstens, Wim, Team Manager within water and industry at Sweco
- Frank Henschel, Water Expert at Sweco
- Max Bremkes, Water Expert at Sweco
- Sebastian Platz, Wastewater Expert at Sweco
- Sara Hagström, GIS- and flooding Expert at Sweco

Reference list

1) European Environment Agency (EEA) (n.d.). Use of freshwater resources in Europe. Available at: https://www.eea.europa.eu/en/analysis/indicators/use-of-freshwater-resources-in-europe-1
2) European Environment Agency (EEA) (n.d.). Water abstraction by source and sector. Available at: https://www.eea.europa.eu/en/analysis/indicators/water-abstraction-by-source-and
3) International Energy Agency (IEA) (n.d.). Energy is vital to a well-functioning water sector. Available at: https://www.iea.org/commentaries/energy-is-vital-to-a-well-functioning-water-sector
4) European Commission (n.d.). Poorly managed water. Available at: https://environment.ec.europa.eu/topics/water/water-wise-eu/poorly-managed-water_en
5) Publications Office of the European Union (2025). A European water resilience strategy (COM/2025/210). Available at: https://op.europa.eu/en/publication-detail/-/publication/02d416a9-41c2-11f0-b9f2-01aa75ed71a1
6) European Commission (n.d.). Too much water. Available at: https://environment.ec.europa.eu/topics/water/water-wise-eu/too-much-water_en
7) European Commission, Directorate General for Environment (n.d.). Water policy. Available at: https://environment.ec.europa.eu/topics/water_en
8) European Commission (n.d.). Groundwater. Available at: https://environment.ec.europa.eu/topics/water/groundwater_en
9) European Commission (2026). European water resilience strategy. Available at: https://commission.europa.eu/topics/environment/water-resilience-strategy_en
10) EurEau (2021). Europe's water in figures 2021. Available at: https://www.eureau.org/resources/publications/eureau-publications/5824-europe-s-water-in-figures-2021/file
11) Sweco (2024). Floods and critical infrastructure. Available at: https://www.swecogroup.com/urban-insight/resilient-societies/resilient-infrastructure/floods-and-critical-infrastructure/
12) Copernicus Climate Change Service (C3S) (2025). European State of the Climate 2024 – Flooding. ECMWF. Available at: https://climate.copernicus.eu/esotc/2024/flooding
13) Swedish Civil Contingencies Agency (MSB) (2025). Several roads cut off after heavy rainfall in Västernorrland County. Available at: https://www.krisinformation.se/en/hazards-and-risks/disasters-and-incidents/2025/several-roads-cut-off-after-heavy-rainfall-in-vasternorrland-county/
14) Copernicus Climate Change Service (C3S) (2025). European State of the Climate 2024 – Snow and glaciers. ECMWF. Available at: https://climate.copernicus.eu/esotc/2024/snow-and-glaciers
15) Sweco (2021). Healthy water cities: From sewer to health booster. Sweco Urban Insight. Available at: https://www.swecogroup.com/urban-insight/health-and-well-being/report-healthy-water-cities-from-sewer-to-health-booster/
16) Rijkswaterstaat (2025). Integrated River Management Programme – Summary (April 2025). Ministry of Infrastructure and Water Management. Available at: https://www.ruimtevoorderivier.nl/documenten/2025/04/08/integrated-river-management-programme-summary-april-2025
17) UK Government (2024). Wild beavers: nature's engineers to return to English waterways. Department for Environment, Food & Rural Affairs. Available at: https://www.gov.uk/government/news/wild-beavers-natures-engineers-to-return-to-english-waterways
18) European Environment Agency (EEA) (2024). Europe's state of water 2024. Luxembourg: Publications Office of the European Union. Available at: https://www.eea.europa.eu/en/analysis/publications/europes-state-of-water-2024
19) Geological Survey of Sweden (SGU) (n.d.). Current groundwater levels. Available at: https://www.sgu.se/grundvatten/grundvattennivaer/aktuella-grundvattennivaer/
20) United Nations Economic Commission for Europe (UNECE) & Food and Agriculture Organization of the United Nations (FAO) (2023). The role of forests in climate change mitigation: Pan-European perspective. Geneva. Available at: https://unece.org/sites/default/files/2023-11/ECE_TIM_2023_Inf.5_FAO_EFC_2023_Inf.5.pdf
21) Smart Water Magazine (2025). Southern Water's smart sensors deliver record leak reduction, saving £17 million. 27 May. Available at: https://smartwatermagazine.com/news/smart-water-magazine/southern-waters-smart-sensors-deliver-record-leak-reduction-saving-17
22) Portsmouth Water Ltd. (2024). Excellence in water, always: PR24 business plan. Available at: https://www.portsmouthwater.co.uk/downloads/pr24/PRT01-excellence-in-water-always.pdf
23) Helsinki Commission (HELCOM) (2025). HELCOM eutrophication policy. Available at: https://helcom.fi/wp-content/uploads/2025/09/HELCOM_Eutrophication_Policy.pdf
24) Økonomiministeriet (2024). Regeringen og parterne i grøn trepart indgår historisk aftale om et grønt Danmark. Available at: https://oem.dk/nyheder/nyhedsarkiv/2024/juni/regeringen-og-parterne-i-groen-trepart-indgaar-historisk-aftale-om-et-groent-danmark/
25) Miljøministeriet (2025). Rent drikkevand: 206 millioner kroner til målrettet beskyttelse. Available at: https://mim.dk/nyheder/pressemeddelelser/2025/april/rent-drikkevand-206-millioner-kroner-til-maalrettet-beskyttelse
26) United Nations Environment Programme (UNEP) (2021). World Water Quality Assessment: Technical highlights – Ecosystems and water quality. Available at: https://www.unep.org/interactives/wwqa/technical-highlights/ecosystems-and-water-quality
27) European Commission, Directorate General for Environment (2026). The cost of PFAS pollution for our society: Final report. Luxembourg: Publications Office of the European Union. Available at: https://op.europa.eu/en/publication-detail/-/publication/2bcea765-fbf8-11f0-8da5-01aa75ed71a1/language-en
28) Swedish Chemicals Agency (Kemikalieinspektionen) (n.d.). PFAS. Available at: https://www.kemi.se/en/chemical-substances-and-materials/pfas
29) European Commission (n.d.). Drinking water. Available at: https://environment.ec.europa.eu/topics/water/drinking-water_en
30) EurEau (2020). The governance of water services in Europe. ISBN: 978 2 9602226 2 3.
31) International Water Association (IWA) (n.d.). Water statistics. Available at: https://waterstatistics.iwa-network.org/
32) World Business Council for Sustainable Development (WBCSD) (2021). Business guide to circular water management: Spotlight on reduce, reuse and recycle. Available at: https://www.wbcsd.org/resources/business-guide-to-circular-water-management-spotlight-on-reduce-reuse-and-recycle/

Urban Insight

By Sweco

Urban Insight is Sweco's international knowledge platform, where experts come together to develop and share insights, facts and solutions about how to plan and design sustainable cities and the societies of the future. Global and local initiatives will be organised throughout the year to inspire and open up discussions about sustainable urban planning.

Find out more by visiting our website:
swecogroup.com/urban-insight

SWECO