



The municipal water leader's guide to future-proof infrastructure

Municipal wastewater systems: a critical infrastructure under pressure

Municipal water networks worldwide are facing a convergence of pressures. Aging infrastructure across many municipalities are now exceeding optimal design life after decades of deferred financing and project bankability limiting the ability to make necessary upgrades. Urban growth is compounding the strain: capacity that was adequate a generation ago is now overstretched, increasing the risk of failures, overflows and service outages.

The scale of the challenge is substantial. The World Economic Forum estimates that the global water infrastructure investment gap will stand at €6.5 trillion by 2040, with 40% of total investment need tied specifically to renewing ageing systems. This is a reality that requires action today.

Wastewater systems are also classified as critical infrastructure, meaning any disruption carries immediate consequences for public health and the environment. That status brings emerging threats of its own: utility operators must now contend with rising cybersecurity risks that could compromise water networks. Climate change intensifies pressure further. Heavier rainfall events, flooding and coastal saltwater intrusion are testing the resilience of pipe networks and treatment plants designed for different conditions.



The challenge is no longer theoretical. System reliability, environmental reliability, and adaptation are becoming an integral part of infrastructure planning.

WORLD ECONOMIC FORUM

€6.5 trillion

global water infrastructure
investment gap by 2040

WORLD ECONOMIC FORUM

40%

of global water investment need is tied
to renewing ageing infrastructure

Regional challenges vary but regulation is increasing

Regulatory requirements for wastewater treatment differ considerably from region-to-region, and local expertise is essential in navigating them effectively. Despite these differences, one trend is consistent worldwide: the overall regulatory bar is rising.

In highly industrialized economies, regulators are tightening standards around nutrient removal, emerging contaminants and reporting obligations. In the European Union, this now extends to new requirements on substances such as PFAS and the introduction of quaternary (fourth stage) treatment under the revised Urban Wastewater Treatment Directive. The enforcement posture in the EU and beyond is shifting to a polluter pays model, in which fines, legal action and reputational damage are becoming material risks not only for utilities, but also for the municipalities and politicians accountable for them.

In rapidly urbanizing countries, the priorities differ. Urban densification is driving the need to expand basic treatment capacity, often through context-specific national legislation. At the same time, new legislation is emerging globally to incentivize the reuse of treated wastewater, creating both obligations and opportunities for forward-thinking authorities.

The numbers reinforce the urgency. Globally, 42% of household wastewater is still not safely treated before discharge. The United Nations' Sustainable Development Goal 6.3 commits all countries to halve the proportion of untreated wastewater by 2030.

Doing nothing is no longer the lowest risk option.

UN-WATER, 2024

42%

of household wastewater globally is not safely treated before discharge

UNITED NATIONS

SDG 6.3



Budget and operating pressures

Public-sector leaders must navigate these rising standards within tight financial constraints. Capital budgets remain constrained even as the expectations placed on wastewater operators continue to grow.

Energy is one of the most significant cost drivers. Water and wastewater facilities together account for an estimated 30–40% of a typical municipality's total energy use, and at a global level wastewater treatment alone consumes roughly 1–3% of all electricity. This heavy energy dependency makes operating budgets sensitive to energy price volatility and places wastewater operations under continuous efficiency scrutiny.

Utilities are being asked to deliver higher performance with fewer resources. Short-term fixes, such as incremental patching of ageing equipment, may provide temporary relief but often increase long-term costs and risk. But proven solutions exist.

As Senior Process Engineer at Alfa Laval, Sipke Verbeek, recently illustrated, replacing ageing decanters with modern technology at a major North American treatment facility made it possible to double capacity with half the power consumption on the same footprint. That kind of step change only becomes visible when decision-makers look beyond immediate power bills to total cost of ownership encompassing disposal, transport, chemicals, diesel and maintenance alongside energy.



Compliance must now be achieved alongside cost efficiency and operational resilience.

WATER ENVIRONMENT FEDERATION

Wastewater facilities account for

30–40%

of total municipal energy use

INTERNATIONAL WATER ASSOCIATION

Wastewater treatment consumes

1–3%

of global electricity

The Opportunity: From wastewater treatment to resource recovery

Wastewater is no longer just a disposal challenge. It is an increasingly valuable resource. Modern treatment facilities can recover and treat wastewater, fundamentally changing the economics of compliance. Eline Suijlen, Water Industry Manager at Alfa Laval explains, Today, wastewater is a resource that can be used for different purposes, such as clean water, energy, nutrients or elements that can be upcycled and then sold as a value-added product.

Improving sludge handling and solid-liquid separation can significantly reduce sludge volumes and the associated costs of transport and disposal. Beyond this, facilities can now generate energy on site. Spiral heat exchange technology capture and converts energy from the treatment process, in most cases through anaerobic digestion, effectively turning a waste stream into a source of electricity and revenue. Energy efficiency and reliability gains from these approaches directly support both compliance targets and broader resilience goals.

The scale of untapped potential is considerable. 80% of the world's wastewater is still released into the environment without adequate treatment, yet this same wastewater contains recoverable value. With 36% of the global population living in water-scarce regions, wastewater reuse is a practical necessity for securing future water supplies and alleviating environmental pressure simultaneously.

The same investments that ensure compliance can also lower lifetime costs.

WORLD BANK

80%

of global wastewater is released into the environment without adequate treatment

WORLD BANK

36%

of the world's population lives in water-scarce regions where wastewater reuse is part of the solution



Proven pathways to cost-efficient compliance



Municipal leaders do not need to start from scratch. Incremental upgrades can deliver measurable gains without full plant replacement. Optimizing existing assets whether through modern dewatering equipment, upgraded separation technology or retrofitted energy recovery systems, often delivers faster return on investment than large-scale rebuilds. Scalable, evidence-based technologies help municipalities future-proof infrastructure step-by-step, adapting to evolving standards without the disruption or capital outlay of a wholesale redesign.

The evidence supports this approach. The OC San plant in California achieved 10% higher cake dryness and up to 40% lower power consumption after modernizing its decanter equipment. Meanwhile, analysis from the World Economic Forum confirms that infrastructure renewal and efficiency investments reduce long-term compliance risk and operating cost compared to deferred action.

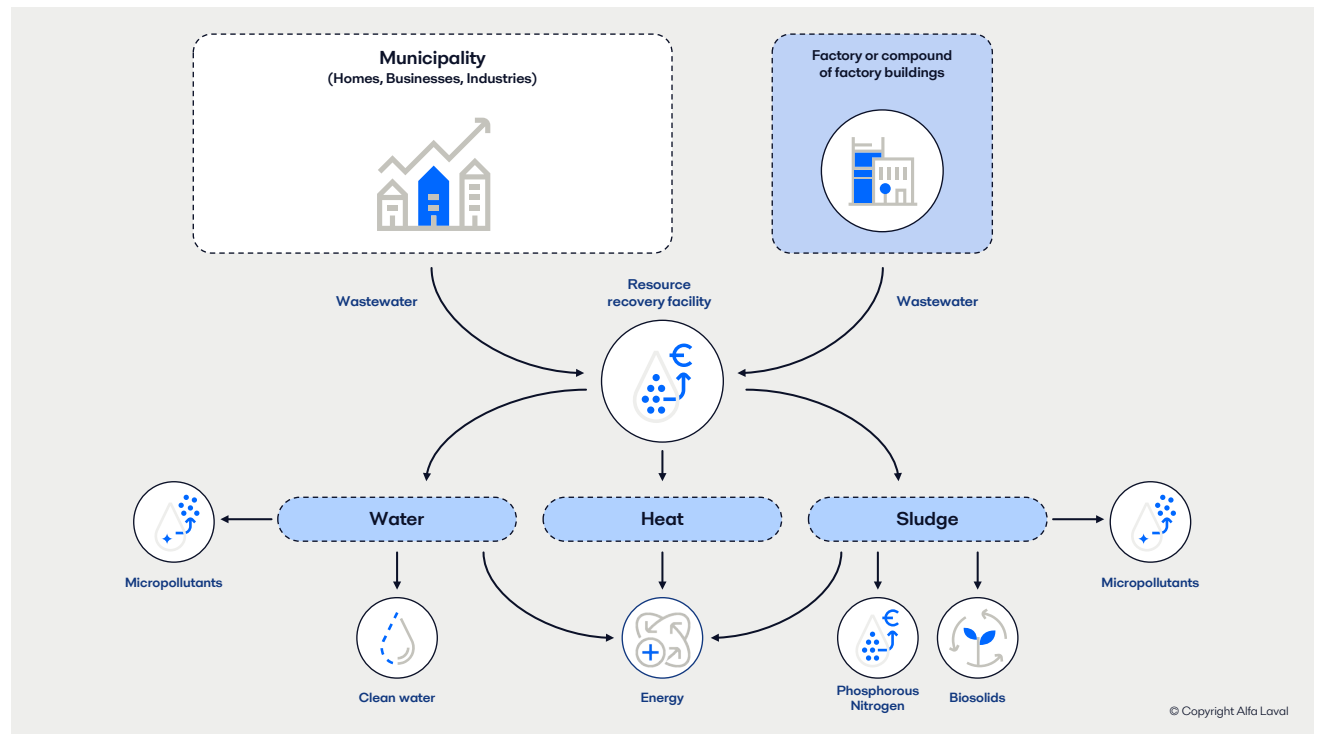
Compliance and efficiency are not competing objectives — when done right, they reinforce each other.

WORLD BANK CASE EVIDENCE

Real-world projects show up to

33%

reduction in water-related costs through reuse and optimization



[Learn more](#)

Wastewater in numbers

A snapshot of the challenge, and opportunity, facing the public sector today:

WEF 2025

€6.5 trillion

additional investment needed by 2040

WEF

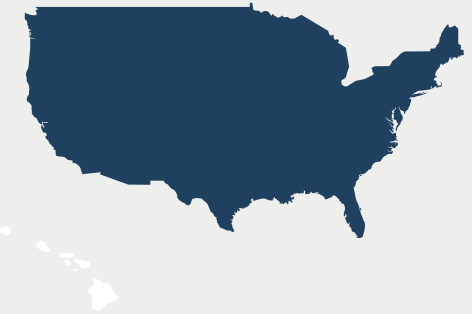
30-40%

of local government total energy use goes to water and wastewater operations



ASCE 2025

US infrastructure grade D+ with failures rising from 2 to 3.3 per 100 miles of pipe



BACK TO BLUE /
OCEAN SEWAGE ALLIANCE, 2025

\$16 billion

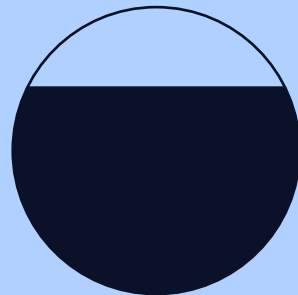
annual crop losses in Brazil from sewage contaminated irrigation water



WORLD BANK 2020

80%

of world's wastewater released without adequate treatment



BBC NEWS

£123 million

record fine levied on a single UK water utility in 2025 by OFWAT



ISRAEL VS SPAIN

90%

VS

20%

wastewater reuse rates of global leaders compared to advanced followers



Why Act Now

Watch the on-demand webcast to learn how municipalities can future-proof their systems with scalable technologies and practical process optimization strategies.



Regulatory pressure, climate impacts and cost constraints are converging simultaneously. Waiting increases risk, cost and public exposure, while proven approaches to modernizing wastewater treatment already exist.

The economic case for action extends well beyond individual municipalities. Closing the global water infrastructure gap could unlock an estimated €8.4 trillion in economic value and support 206 million jobs worldwide. Every authority that invests in future-ready wastewater infrastructure contributes to this broader economic dividend while securing local gains in compliance, service reliability and long-term financial sustainability.



Now is the time to shape the future of wastewater treatment.



Watch the on-demand webcast to learn how municipalities can future-proof their systems with scalable technologies and practical process optimization strategies.

Scan to watch



Future-proof for tomorrow.



Contact Alfa Laval

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