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Let's Solve Water

NET Zero
THE RACE
WE ALL WIN

Meet the Utilities Setting the Pace on Decarbonization

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Net Zero: The Race We All Win

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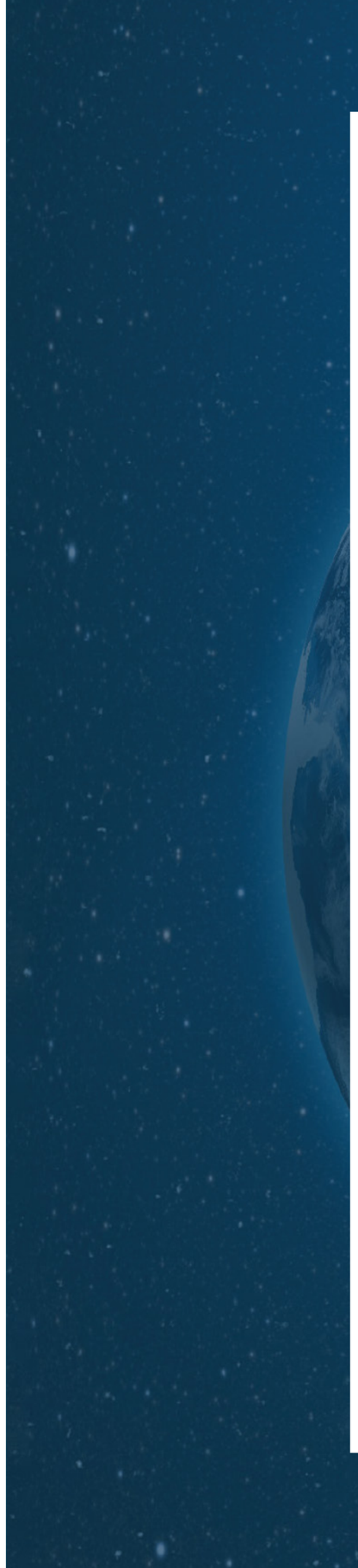


Introduction

The Race to Net Zero is on

When humans began building civilizations, we built around water. For millennia, we have grappled with the ambition of designing solutions to enable water security and sanitation for communities and economies.

Today, the climate crisis presents a new challenge as global temperatures rise at unprecedented rates. As we pass the halfway point to meeting the Paris Agreement goal of 1.5 °C, the message is clear: **the world needs to pick up the pace.**

Reducing the water sector's greenhouse gas (GHG) footprint is essential to delivering the world's decarbonization agenda. Lowering GHG emissions will also lessen the impact of climate change over time, alleviating the adaptation burden facing the sector.

Xylem's 2022 paper, Net Zero: The Race We All Win, aimed to codify water utility decarbonization through a four-step roadmap. Since then, momentum has been building, with collaboration proving a powerful catalyst. Peer networks – including utilities, consultants, and technology vendors – are enabling best-practice sharing and helping to scale solutions.

To further those conversations, we consulted utility leaders from Belgium, Chile, China, Germany, New Zealand, and Scotland, to understand their experience and capture their insights.

WATER SECTOR'S GLOBAL GHG FOOTPRINT

1.8% Carbon emissions

4.7% Methane emissions

3.4% Nitrous oxide emissions

Estimates from Global Water Intelligence

The organizations consulted for this paper span the scope of utility sizes and resources. Each demonstrates how data-driven approaches can drive meaningful progress at a pace appropriate to operational circumstances:

1. Setting Realistic Targets:
Working towards data-backed targets to drive incremental progress, Aguas Andinas (part of Veolia Group) in Chile is on track for significant reductions in all three carbon scopes by 2030, leveraging renewable energy and direct measurement of emissions for accuracy. Beijing Drainage Group in China is working to achieve decarbonization targets aligned with broader municipal goals, with an emphasis on using digital tools to increase energy efficiency.

2. Optimizing Existing Assets:
In Scotland, Scottish Water is using net zero as a catalyst for innovation by assessing how to cut energy consumption and maintenance costs, reduce carbon output, and optimize asset performance.

3. Prioritizing Capital Planning:
Belgian utility De Watergroep is embedding sustainability into its long-term capital planning. It assesses projects based on their lifetime carbon cost, among other criteria, to prioritize initiatives that minimize the need for new grey infrastructure and align with climate neutrality goals.

4. Planning for the Future:
Watercare in New Zealand and Ruhrverband in Germany are pursuing holistic strategies focused on understanding long-term emissions to advance sustainability and resiliency. These include transitioning to renewable energy sources, generating onsite renewable energy, and managing process gas emissions.

These utilities show that water sector GHG emissions are a solvable problem. Their experiences provide a blueprint for driving decarbonization progress. Through knowledge sharing and open collaboration, the water sector can move further, faster. This is a race we can all win.

Decarbonization Roadmap

Towards Net Zero and A Sustainable Future

1 Setting Realistic Targets

"We are cautious but committed in our approach to net zero, focusing on realistic and achievable goals that align with our sustainability vision. Accurate data collection and analysis are foundational for setting carbon reduction targets. We plan to implement direct measurement in our plants to overcome challenges in obtaining accurate data, particularly for emissions like nitrous oxide."

– Felipe Sánchez, sustainability manager at Aguas Andinas, Santiago, Chile

Every utility faces unique challenges on the path to net zero. Targeting incremental progress is a universal strategy to drive results. While there may be data gaps or operational issues to address, obstacles can be overcome. By setting realistic, data-based targets and adopting tailored strategies, utilities can chart a path to success.

For example, **Aguas Andinas** in Chile, which supplies water and wastewater to the capital city of Santiago, is prioritizing data-backed targets that will reduce its emissions across the three carbon scopes. It is developing a better understanding of its process emissions before setting any net-zero targets.

The utility is currently targeting a 54% reduction in Scope 1 (direct) and Scope 2 (indirect) emissions and a 16% reduction in Scope 3 (external) by 2030. By exploring every available avenue, including purchasing renewable energy, improving energy efficiency, and maximizing onsite energy generation, the utility has reduced emissions across all three scopes by 25%.

According to Felipe Sánchez, sustainability manager at Aguas Andinas, the switch to renewable energy has proved the most effective at delivering an immediate reduction in emissions, building the momentum needed to reach the utility's interim targets. Over time, he believes capturing nitrous oxide emissions will reap the biggest environmental dividend.

Like most utilities, Aguas Andinas uses estimates to factor in nitrous oxide emissions. Produced by bacteria at the biological treatment stage in wastewater, these emissions are notoriously difficult to quantify due to the complex chemical and physical processes involved. This is starting to change as innovative utilities, including Aguas Andinas, begin to deploy sensors to directly measure process gas emissions. With more accurate baselines, utilities can begin to reduce their footprint by optimizing process control.

Sánchez and his team are taking steps to mitigate the utility's GHG impact while adapting to immediate climate challenges. Despite enduring frequent floods, Chile remains in prolonged drought. The utility's strategy revolves around realistic targets that account for the region's severe water stress.

"Everyone feels the stress from climate change. Our people want to adapt, and they want to mitigate. A harsher climate presents immediate risks that we need to be resilient against, but the long-term risk is that, without GHG mitigation, our climate will only become more hostile," he said.

KEY TAKEAWAY

Aguas Andinas has mapped pragmatic decarbonization plans, focusing on achieving its 2030 targets before committing to a net-zero goal. The utility holds itself accountable through a data-driven approach to track incremental progress.

INSIGHT

Don't set a net-zero target without accurate baseline data. Reduce carbon wherever you can and measure the impact – once you fill data gaps, tangible targets can follow.

The Chinese utility **Beijing Drainage Group (BDG)** has aligned its decarbonization targets and strategy with the city's carbon-neutrality goals.

"Sustainability and carbon neutrality targets go hand in hand with programs such as digital transformation. We shaped our digital plan to advance our own net-zero goals while supporting our capital city's wider carbon neutrality target of achieving peak carbon emissions by 2030," Yongtao Ge, director of operations at BDG, said.

BDG was the first utility in China to commit to ambitious carbon neutrality goals, setting a roadmap to reduce carbon emissions by 20% by 2025, reduce carbon intensity and carbon emissions by 40% by 2035, and achieve total carbon neutrality by 2050.

With clear targets set, the utility has combined digital technology with energy-efficient equipment to reduce energy consumption by up to 15%. This transformation has led to BDG's Wujiacun facility becoming a benchmark for low-carbon treatment plants.

"We're also building China's first-ever carbon-neutral standard water reclamation plant. When completed, it will be the world's largest treatment plant of its type. For us, every lever we can pull to reduce our carbon emissions – no matter how big or small – paves the way to a more sustainable future," he added.

KEY TAKEAWAY

BDG has anchored its net-zero targets in the organization's strategic goals and regional decarbonization agenda. This holistic approach empowers teams by demonstrating how individual targets support broader outcomes.

INSIGHT

Connect with your City or County to align on regional net-zero goals. Solo runs are of limited value. Collaborative net-zero efforts will achieve outsized results.

2 Optimizing Existing Assets

Hitting net-zero goals does not have to be a burden. It can be a catalyst for building a culture of data-driven decision-making and optimization. Take **Scottish Water**, which is responsible for providing water and wastewater services to more than 2.6 million homes and 150,000 businesses across Scotland.

The utility has a roadmap to become carbon neutral by 2040 by transforming how it delivers water and wastewater services. A key element of the plan is increasing the sustainability of its wastewater pumping stations, essential for moving water waste across a large geography, including remote villages and islands.

With significant GHG emissions stemming from both energy and maintenance, the utility needed to find a way to deliver the same service at a lower carbon cost. According to Scottish Water, wastewater pumping is around 29% of its electricity consumption while wastewater operations make up 17% of the utility's transport emissions.

"Moving and treating wastewater is incredibly energy-intensive," Nathan Wield, wastewater operations west manager for Scottish Water, said. "With smart technology, we can deliver cost savings for the Scottish people and reduce our impact on the climate."

To start, Scottish Water chose two pilot sites, Maple Grove and Cross Dene, where it combined high-efficiency pumping systems enhanced with advanced digital technology to reduce energy consumption and maintenance costs. The results were transformative: energy usage fell by 40% and unplanned maintenance costs dropped by 99%.

"By deploying advanced technologies, we can make our assets work harder and smarter. Not only does this improve efficiency, but it also prolongs the life of our equipment, reduces service disruptions, and improves our overall environmental impact," he added.

Wield and his team subsequently deployed remote monitoring across Scottish Water's network of pump stations, enabling the utility to replace weekly callouts with monthly inspections. This move has saved thousands of miles of reactive travel, and thousands of liters in diesel consumption, significantly reducing the utility's annual carbon output.

KEY TAKEAWAY

Scottish Water used net zero as a catalyst for innovation. By deploying remote monitoring technology to reduce energy use and cut down on unplanned maintenance, the utility is addressing carbon and optimization goals, hand-in-hand.

INSIGHT

Embed decarbonization goals into all technology proposals and agreements. Optimize assets to deliver operational efficiencies and sustainability wins.

3 Prioritizing Capital Planning

"Water is vitally linked to the environment and impacted by how we treat nature and society, so sustainability is in our DNA. Our culture is to take care of water for today and future generations. That means designing projects with long-term carbon impact in mind."

– Hans Goossens, chief executive of De Watergroep, Flanders Belgium

The pragmatic path to net zero is about finding ways to fold sustainability considerations into existing processes and capital decision-making for lasting changes. The urgent must not eclipse the important – long-term mitigation is needed to ensure that the climate emergency does not grow worse, or eventually utilities will simply run out of ways to adapt.

For example, **De Watergroep**, the largest drinking water supplier in the Flanders region of Belgium, has shaped an ambitious decarbonization agenda. Having already achieved significant GHG reduction through more sustainable energy use, the utility has turned its attention to embedding long-term sustainability into capital plans. This includes minimizing the need for future grey infrastructure and accounting for the long-term carbon impact of every project as it works towards being energy-neutral by 2030 and climate-neutral by 2050. "You only have a business in the future if you are sustainable.

If we can work on adaptation and mitigation, we avoid the increasing need to adapt to even more extremes," Hans Goossens, chief executive of De Watergroep, said.

Tackling capital carbon is something almost every utility will face, particularly when it comes to large infrastructure projects. However, a sustainable ethos extends beyond just saving carbon emissions during the construction phase.

"Just because something is new doesn't mean it's always better for our carbon footprint. We need to carefully assess investments based on the lifetime carbon cost of a project," Goossens added.

Taking a whole-of-life carbon perspective to inform the environmental-benefit analysis of new infrastructure is the best way to accurately gauge sustainability impacts. For instance, to reduce capital carbon, Goossens and his team are reevaluating technical requirements for pipelines to make decisions based on factors such as longevity – saving both money and carbon over the long term.

For utilities like De Watergroep, the key is finding a balance between long-term forecasts and revenue models based on the drivers of consumption, while carefully accessing what projects will positively impact sustainability metrics over their entire operational lifetime.

KEY TAKEAWAY

De Watergroep is incorporating sustainability into everyday decision-making and long-term capital planning to prioritize projects that reduce the utility's current carbon output and the need for future grey infrastructure.

INSIGHT:

Rethink Return on Investment (ROI). Reframe your cost-benefit analyses for new projects to account for long-term carbon reduction.

4 Planning for the future

"Every decision we make has to consider the future, including how we operate today and how we build, operate, and power in a net-zero world. We need to build in a way that we're proud of when we look back."

– Chris Thurston, former head of sustainability at Watercare, Auckland, New Zealand

Decarbonization is an opportunity to reimagine conventional water management and transform water utilities into engines of energy production. For **Watercare**, New Zealand, decarbonization is about more than achieving emissions reduction goals. The Auckland-based utility, which serves 1.7 million people, is rolling out a comprehensive strategy to modernize its network, including phasing out fossil fuels through energy efficiency, switching to renewable energy, and generating onsite renewable energy.

Chris Thurston, former head of sustainability at Watercare, and his team achieved some early wins by purchasing renewable energy from the grid – a common approach to delivering quick sustainability gains.

Looking ahead, Thurston emphasizes the need to integrate capital and operational strategies more closely, considering the entire lifecycle of infrastructure projects to ensure that decarbonization efforts are both effective and sustainable in the long term. This is apparent in the utility's energy transition.

Watercare has already increased efficiency and resilience by generating energy onsite, with six solar projects underway and more in the pipeline. As part of its solar strategy, Watercare has also launched New Zealand's first floating solar array.

KEY TAKEAWAY

Watercare developed its net-zero strategy as part of a holistic infrastructure modernization agenda, enabling it to prioritize investments that drive both operational and sustainability goals.

INSIGHT

Buy renewable energy where possible. Better still, generate it onsite.

For wastewater utilities, net zero goes beyond energy and water use. Process emissions, which usually refer to methane and nitrous oxide that escape from the biological treatment and sludge treatment processes, are the most challenging frontier for the water sector and are notoriously difficult to measure. The US Environmental Protection Agency estimates that 6% of the nation's nitrous oxide (N_2O) emissions come from wastewater treatment alone.

Ruhrverband, located in Essen, Germany, which supplies water to 4.6 million people and treats sewage for 60 cities and communities, is one of the utilities tackling process emissions head-on. It has set an initial target of net energy neutrality by 2024, which will build to climate neutrality by 2030.

As part of a comprehensive strategy towards GHG emissions reduction, Kassandra Klaer, deputy head of the department responsible for climate at Ruhrverband, emphasized the importance of understanding emissions sources and leveraging technology to manage process emissions like methane and nitrous oxide effectively.

The utility has started a monitoring program at two of its treatment sites – one of its largest wastewater treatment plants, and one smaller wastewater treatment plant. It will model this data and potentially add artificial intelligence (AI) to help mitigate nitrous oxide emissions.

Ruhrverband is not working in isolation. Utilities across the North Rhine-Westphalia region have leaned on each other to accelerate progress by regularly sharing best practices and resources.

Most utilities in Europe aerobically treat wastewater, which produces methane during the sludge treatment phase. Technologies – using heat and sometimes manipulating pressure to reduce sludge volume – are becoming more advanced. Some utilities collect methane, which can be used or sold as a green energy source.

Utilities are also looking at ways to better dispose of sludge – usually achieved through emissions-intense incineration. Ruhrverband is examining ways to minimize emissions through how the sludge is treated and dried.

KEY TAKEAWAY

Ruhrverband is taking a long-term outlook to support resiliency and sustainability by generating power onsite and managing nitrous oxide and methane gas emissions.

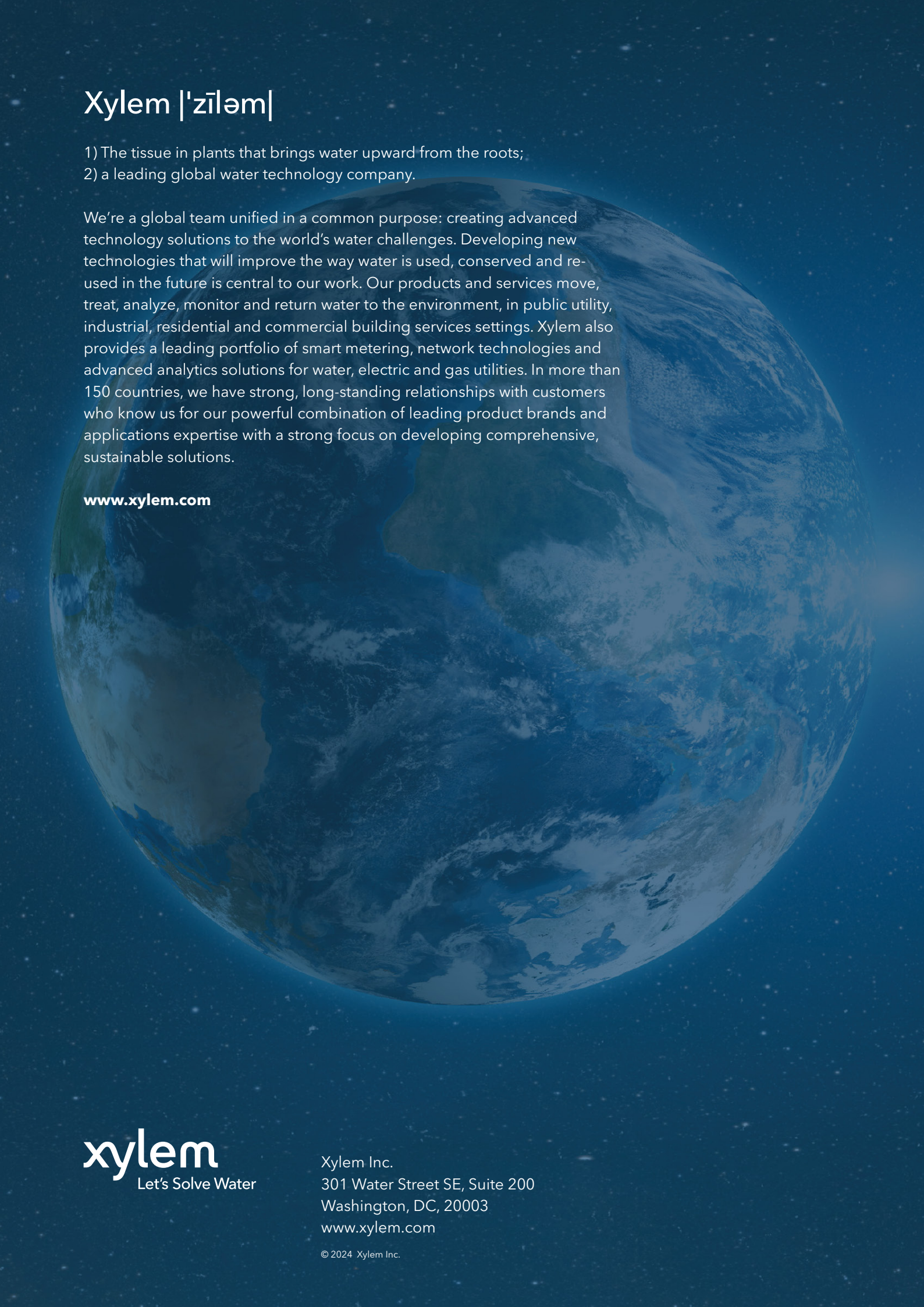
INSIGHT

Shift from viewing process waste as a problem to solve to an asset to harness. Don't simply estimate process emissions, monitor, manage and monetize them.

Conclusion

Every action counts in the global effort to reduce emissions. As the utilities consulted for this paper show, net zero is not merely an ambitious goal, but a realistic evolution of how we manage water.

From tackling wastewater process emissions to managing the water-energy nexus with renewable power, water utilities are stepping up on climate action. The growing prevalence of data-driven approaches to climate mitigation, coupled with a culture of open collaboration, is moving the sector towards a more sustainable, resilient, water-secure future.



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1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services settings. Xylem also provides a leading portfolio of smart metering, network technologies and advanced analytics solutions for water, electric and gas utilities. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

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