SCALING WATER REUSE IN INDUSTRY

Exploring the need for a global ambition

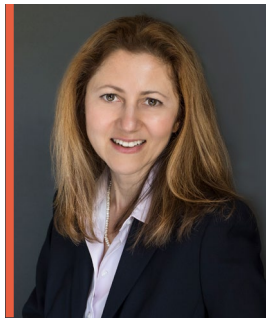
May 2025

GWI GLOBAL WATER INTELLIGENCE

BLACK & VEATCH

WHITE & CASE

FOREWORD



Zeynep Erdal, Vice President and Integrated Solutions Director, Black & Veatch

"As water stress exposure reshapes our public and industrial water management, we are keenly focused on integrated water strategies such as water reuse that supports water resilience and environmental sustainability. This sharp focus, supported by corporate stewardship, can scale implementation, reduce operational disruptions, regulatory conflicts and public concerns and help industries reach their ESG goals."

As water supplies become more strained due to factors such as population and economic growth, and climate driven changes in availability, or abundance and water quality, communities are also being challenged due to other factors such as increasing pollution, aging infrastructure and resource limitations that create new constraints. As a solution, we are putting more focused attention to integrated solutions that maximize value and outcomes. One such approach is water reuse at scale.

Water recycling and reuse in the context of One Water allows growth to occur sustainably, taps into municipal and industrial synergies, and protects environmental resources for all. Growth trends in industries such as semiconductors, specialty manufacturing, data centers, mining, battery manufacturing and power generation are forcing all of us to think differently to maximize the water use cycle by reducing and / or eliminating once-through wasteful operations. According to a World Bank Group 2024 report, globally only 8% of the freshwater withdrawals for industrial and domestic use are later treated for reuse and recycling. Water reuse can turn this inefficient, once-through horizontal production line into a circular systemwide solution for all stakeholders.

To scale up water reuse and increase its benefits at a global scale, we must focus on thoughtful leadership and policymaking coupled with innovative planning, partnership, funding and regulatory solutions. As rapid technology innovations and industry growth push and pull the engineering and private sectors, we are realising that the speed at which we could respond to these needs has to increase incrementally.

This paper will set the stage for defining the current baseline for water reuse applications in municipal and private sectors. Building on this foundation with innovative thinking, we can accelerate policymaking, infrastructure renewal, corporate water targets, public-private collaborations, and ultimately scale water reuse to maximise its potential.

FOREWORD

Joanne Emerson Taqi
Partner, White & Case

"Industrial water reuse is no longer optional – it is essential. As awareness of water scarcity, regulatory demands, and reputational pressures grow, businesses must navigate a complex landscape with clarity and confidence. Thoughtful guidance, strong partnerships, and innovative strategies will be key to unlocking sustainable, scalable water solutions across industries."

Water is a fundamental enabler of industrial growth, yet it remains a constrained and undervalued resource in many parts of the world. As industries confront increasing water scarcity, stricter discharge regulations, and mounting pressure to meet sustainability targets, the case for industrial water reuse has never been more compelling.

This white paper brings together insights from a broad range of global companies, spanning sectors from food & beverage to consumer products, pharmaceutical, and energy. These leaders share a common challenge: securing resilient, sustainable water supplies while navigating economic, technical, and regulatory barriers. What emerges is a clear recognition that water reuse is not just a compliance measure or cost-saving initiative – it is a strategic necessity.

Despite advances in treatment technologies, the path to scaling reuse remains complex. Companies must contend with infrastructure gaps, high energy demands, social perceptions of recycled water, and a persistent lack of fit-for-purpose policy frameworks. Yet, as this paper shows, forward-thinking organisations are rising to the challenge – integrating internal recycling systems, partnering with municipalities, and reimagining supply chains to close the water loop.

By documenting both the obstacles and the opportunities alongside current practices, trends, and case studies of successful projects, this paper provides a timely and pragmatic resource for industry leaders, policymakers, and innovators. It underlines that water reuse is not a one-size-fits-all solution, but rather a spectrum of strategies that must be tailored to local conditions, business priorities, and stakeholder expectations.

We hope this paper will accelerate dialogue, collaboration, and action so that adoption and application of industrial water reuse can become not the exception, but the norm.

PUBLISHER'S INTRODUCTION

Christopher Gasson
Publisher, Global Water Intelligence

"The Global Commission on the Economics of Water proposed a target of recycling 50% of water abstracted from nature in its final report. This white paper grows out of the need to understand how such a target for water reuse might be interpreted by industrial water users so that it is economically and environmentally attractive."

I joined one of the Commission's research calls back in January 2024. It was being chaired by the President of Singapore, Tharman Shanmugaratnam. He asked me what I thought could work as a target for water that might match net zero for carbon. I replied that such a target was not possible. Water isn't like carbon. One litre of water has a very different impact depending on the time and place that it is withdrawn, and furthermore, water is involved in every aspect of human activity. It is 60% of our bodies. No single number can summarise the myriad different ways in which water is life.

Shanmugaratnam persevered. "What about a target for water reuse?" he asked. I thought about it for a moment and realised that it was actually a genius suggestion. If there is one thing that we can do that would contribute most to reducing the human impact on the water cycle without impeding the flourising of humanity, it would be to reuse more of the water that we abstract from the ground. When the Commission published its report, it included as Goal 2 of Mission 3: "Recycle 50% of water to enable every drop of water used to generate a new drop".

It is a great aspiration. But what does it actually mean for industrial water users? Already, each drop of water abstracted for use in industrial processes is used at least twice before it is discharged. Does that mean that industrial water users can ignore the target?

The truth is that industrial water users probably have to think more about their future water use than anyone else. Climate change is bringing new extremes of droughts and floods. In order to avoid growing conflict with other water users over access to freshwater, it will be necessary to sever the link between water demand and economic growth. This will only be possible with greater reliance on used water sources.

A target might focus attention on reuse, but it is unlikely to lead to any real change if the numbers don't add up economically. We need a target that does not limit growth. This white paper aims to start the discussion about what that might look like.

Contents

Executive summary

The case for recycling industrial effluent streams is already clear. It turns a potential environmental liability into a drought-proof freshwater resource. As climate change increases the severity of droughts and floods, water security will become more valuable. The marginal cost of freshwater resources is likely to rise as a result of the over-exploitation of low-cost water resources and the growing difficulty of securing drought-proof water supplies. This, together with the potential for innovation to reduce the cost of water reuse technologies, should ensure that reuse becomes the lowest-cost water source for most industrial water users.

Interviews with some of the leading companies uncovered the following obstacles:

- The low cost of freshwater versus the high cost of treatment
- Inadequate regulations and governance incentives
- Technological complexities and operational expertise
- The lack of consistent staff expertise on water conservation
- Lack of providers of reclaimed water
- The trade off between water and energy use
- Negative perception of recycled water

Currently, **water reuse is not widely targeted by industrial water users**.

A survey of the top 20 companies in 13 water-intensive industries showed that **60% do not monitor the rate of water reuse**.

This is in part because of the **lack of a widely accepted metric** to determine the rate of reuse.

We need to develop one.

Water reuse of today

- Advanced recycling is seen as an expensive and challenging option
- Carried out where necessary in areas of water stress or regulatory pressure
- Emphasis on onsite reuse projects
- Lacking standardisation of reuse definitions and practices
- Low visibility into reuse practices due to minimal reporting

Water reuse of the future

- Championing reuse projects both onsite and beyond the fenceline
- Engaging a variety of stakeholders to find beneficial reuse opportunities: industrial water users, utilities, supply chain partners and investors
- Sharing knowledge, best practice and project experience to build reuse capabilities
- Leveraging innovation to lower the cost of reuse and find co-benefits

The water reuse imperative

Global Water Intelligence has teamed up with the Water Resources Group (a multi-donor trust fund administered by the World Bank) to promote the "Scaling Water Reuse Initiative". A potential outcome of this initiative is the adoption of a Global Ambition for Water Reuse by the UN. The purpose of this white paper is to explore what this might mean for industrial water users. An "ambition" is like a target, but inspirational rather than binding. It will only be effective if there is an economic logic as well as an environmental logic behind it.

The case for water reuse

The world faces three big water challenges:

(1) The mismatch of demand and supply where it matters most.

The strongest pressure on water supplies is in big cities and productive agricultural regions in arid parts of the world. The marginal cost of developing new water resources is rising fast in these areas.

(2) Freshwater quality is declining.

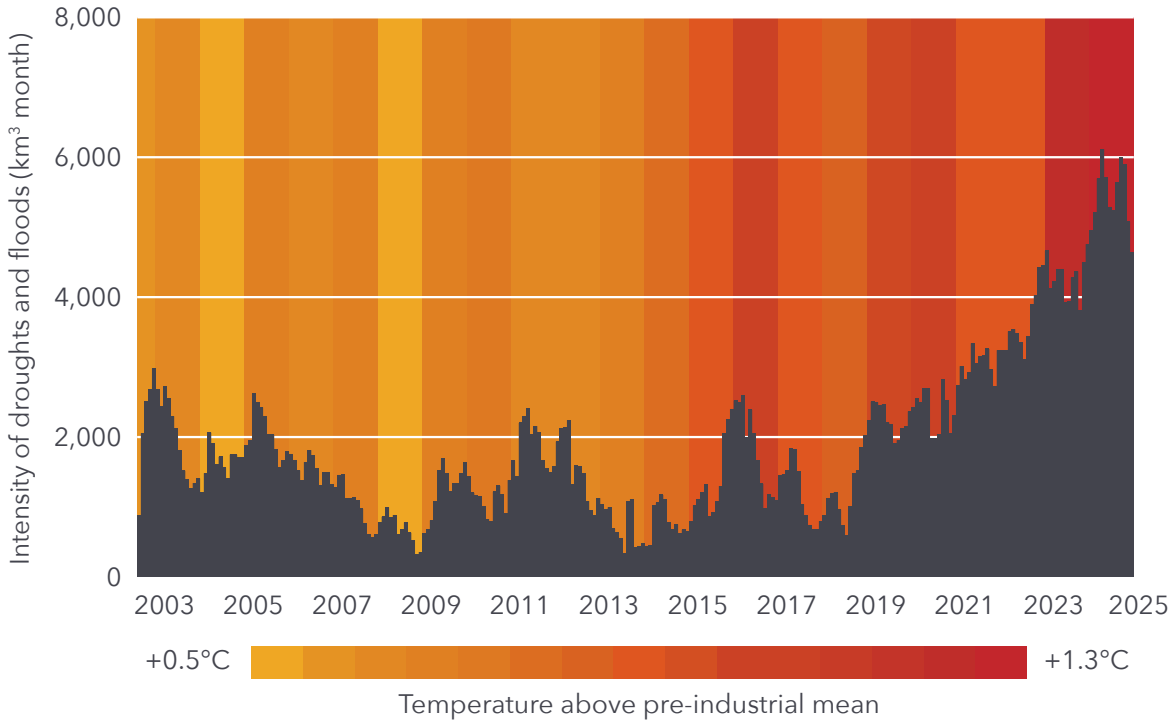
As we use water more, in agriculture, in industry and in homes, the quality of what is available is declining. In particular we are seeing a build up of salt in the freshwater cycle.

(3) Climate change is increasing the intensity of wet and dry events.

Higher global temperatures mean two things. First, there is more energy and more water in the atmosphere, leading to more intense rainstorms. Second, the heat means that dry weather events are becoming more extreme and persistent. The chart here illustrates the alarming rise in intensity of both wet and dry events as global temperatures have increased. While there is some regional variation in the distribution of wet and dry events, the overall message of the data is that water security is now a completely global issue rather than one restricted to historically arid regions.

It is the way these three factors are interacting that makes the development of new water resources an urgent global priority. Although water reuse does not address the wet side of climate change, it is a uniquely attractive solution to the other water challenges we face. It provides additional water resources where they are used most, it improves freshwater quality by putting a greater emphasis on treatment, and it is an effective insurance against drought events.

The intensity of droughts and floods is rising as global temperatures increase



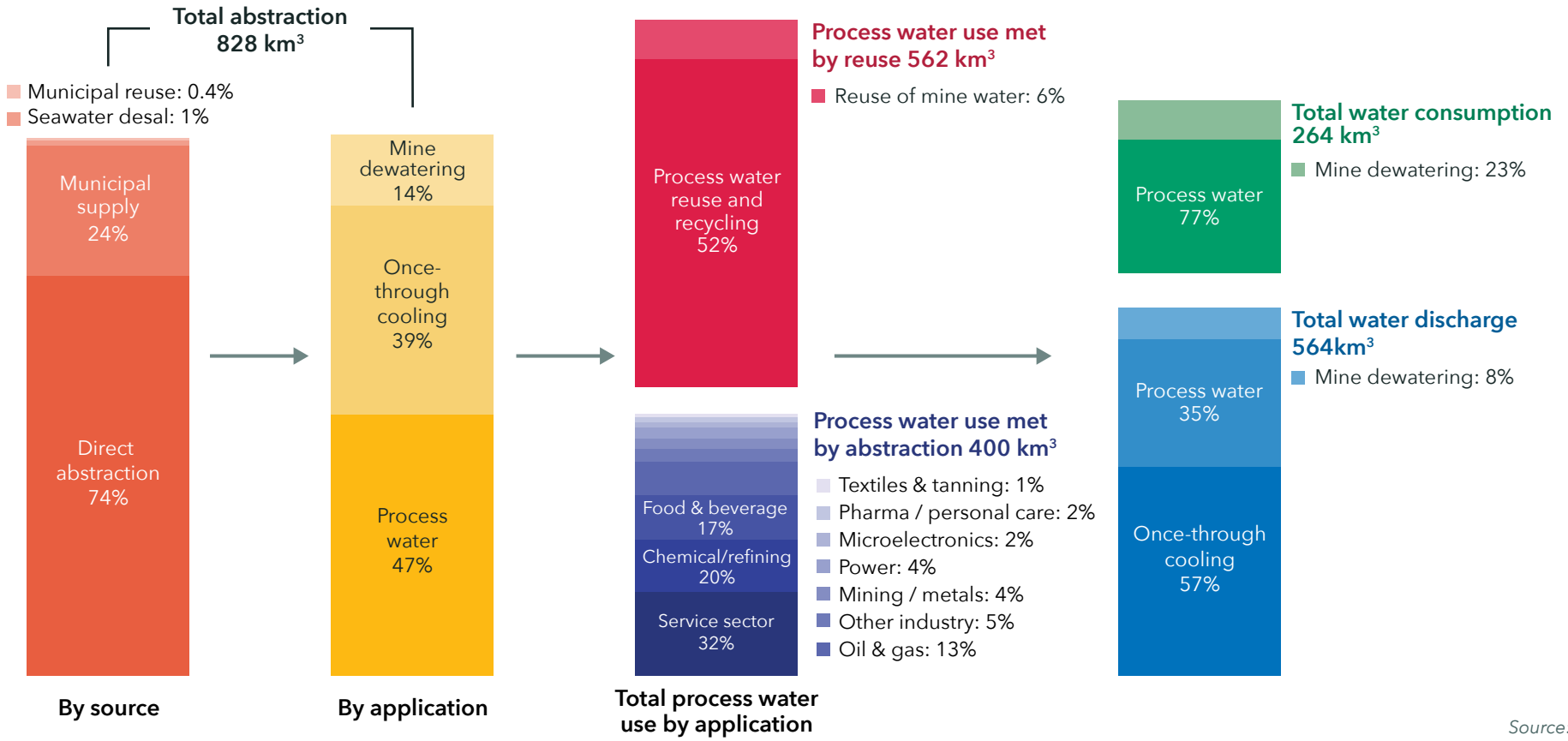
Since August 2002 NASA's GRACE project has been monitoring terrestrial water storage on the basis of how surface water, groundwater, and soil moisture disrupts Earth's gravitational field. Researchers at the Goddard Space Flight Centre have developed a methodology to use this data to monitor the intensity of extreme wet and extreme dry events*. This shows a significant correlation between rising temperatures and the increasing intensity of these events.

**See Rodell & Li "The changing intensity of hydroclimatic extreme events revealed by GRACE and GRACE-FO", Nature Water Vol 1 March 2023 241-248*

Water use in industry today

Around 828 km³ of freshwater was used by industry in 2024. Some of this comes from municipal supply, but the majority is withdrawn directly from the environment. The largest single use of water is once-through cooling in the power sector and other heavy industries. This water is returned directly to the body of water from which it was withdrawn. The second largest use is not really a use: it is the necessary dewatering of mines where the resource lies beneath the water table. The remainder of freshwater used in industry is known as 'process water' and uses include cooling, heating, washing, steam generation, dissolving chemicals, and transporting materials. Much of this water is recirculated, recycled or repurposed on site, meaning that gross process water usage is considerably higher than net water withdrawals. Overall, around half of industrial process water is not returned to the body of water from which it was withdrawn.

A breakdown of annual industrial water use



Source: GWI

Future dynamics of water use in industry

Our analysis of water use in industry on the previous slide exposes a much more complex picture than has historically been understood. It shows that, with the exception of once-through cooling systems, water use in industry is remarkably efficient. It also highlights the knotty trade off between reducing water withdrawals and reducing the proportion of used water returned to the environment. On this slide we highlight some of the issues that need to be taken into account when considering a global ambition for water reuse.

Once-through cooling is being phased out

The biggest users of once-through cooling systems are aging coal and nuclear plants. Environmental regulation, together with the growth of renewable energies that don't require a cooling loop, means that water demand for once-through cooling could fall by as much as 50% by 2040.

The AI revolution is not so thirsty

There has been much alarm about the volumes of water consumed by chip makers, data centres, and the power production they require. GWI's analysis is that as a result of direct to chip cooling, the growing use of renewable energy, and increased efficiency, the total additional freshwater demand related to the AI revolution is unlikely to be greater than 10 km^3.

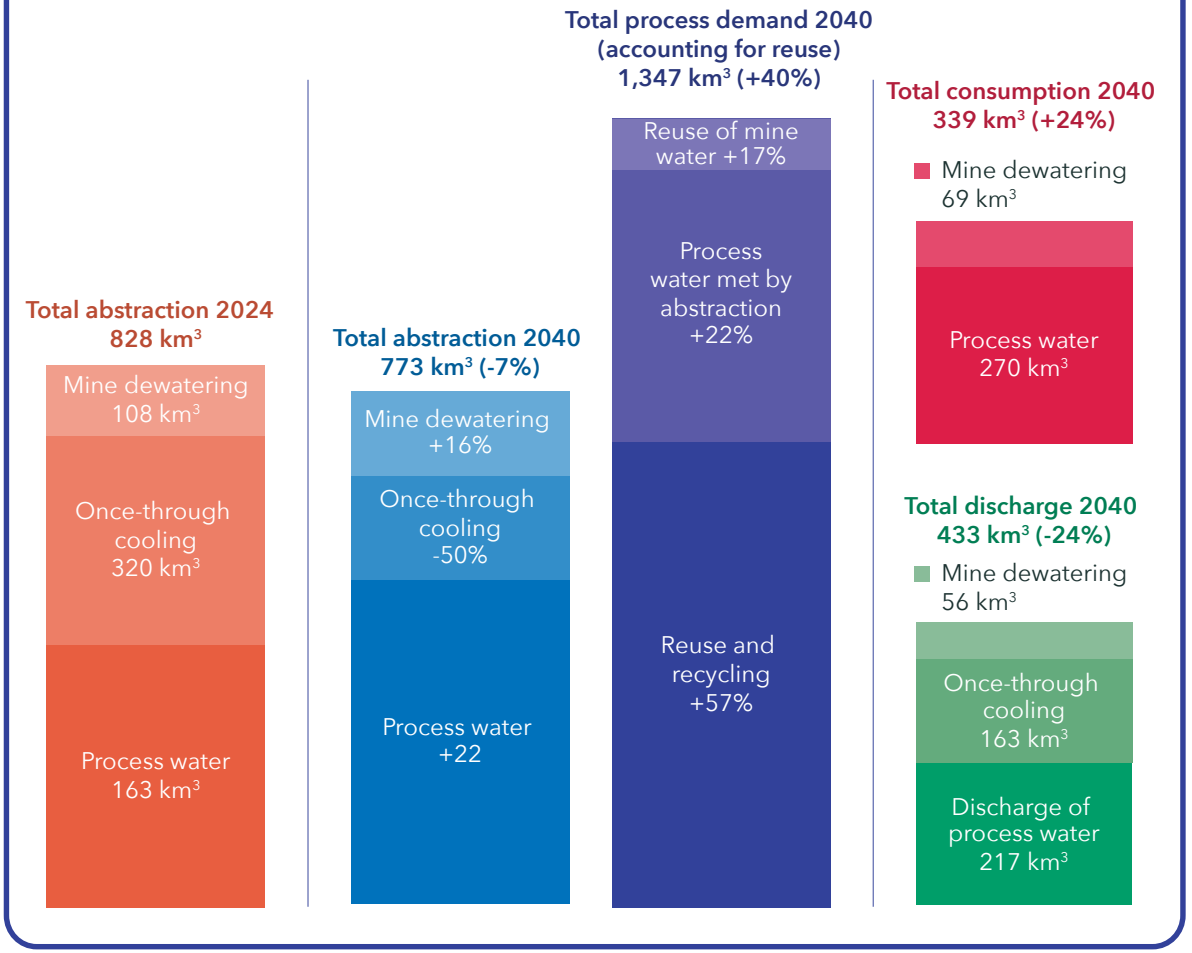
GDP growth versus stewardship commitments

Many major companies have made public commitments to reducing their water use per unit of product. All other things being equal this might lead to a 10–15% reduction in the volume of water abstracted by industry by 2040. This will be offset by the impact of GDP growth which might otherwise be expected to drive a 42% increase in water demand over the period.

Is business as usual going to be enough?

Overall freshwater use in industry is expected to fall by 7% by 2040, largely because of the reduced demand for once-through cooling. However, process water demand will rise by 40%. This increase will be accommodated by a 22% increase in freshwater abstraction and a 57% increase in onsite water reuse (there is no other way that water stewardship targets can be met). Do we need to be more ambitious than this? The argument for a more aggressive target for industrial water reuse grows out of the economic cost of water insecurity.

GWI's forecast of industrial water use suggests lower abstraction but higher consumption



The economic case for water reuse

The economic case for increased water reuse is based on the fact that higher global temperatures are making existing water resources less reliable. This will bring significant operational risks for all businesses that use process water. In drought situations, typically household water needs are given preference over business water needs. It means that reducing overall withdrawals to ensure that urban water storage does not become exhausted, and being able to operate on minimal freshwater abstractions, are the most effective means of avoiding disruption.

Droughts will cost $50 billion a year by 2040

The World Economic Forum calculated that the economic losses related to droughts were in the region of $10.5 billion per year during the 2010–20 decade*. If the relationship between global temperatures and intensity and frequency of droughts established by the NASA GRACE project continues to hold, then we should expect total economic losses to reach $50 billion per year by the 2040–2050 decade.

The marginal cost of freshwater will reach $1/m³

Historically the vast majority of water used in industry has cost less than $0.10/m³, but the lowest cost sources of water have already been exploited. In many parts of the world (e.g. Australia, the western United States, the Mediterranean region) the marginal cost of bulk water supplies is now above $0.50/m³. By 2040, the average global "drought-proof" marginal cost of raw water is likely to be in the region of $0.40/m³. This doesn't just mean that the businesses needing extra water will need to pay more for it. It also means that governments, not wanting to invest additional supplies, will pressure industrial users to use less.

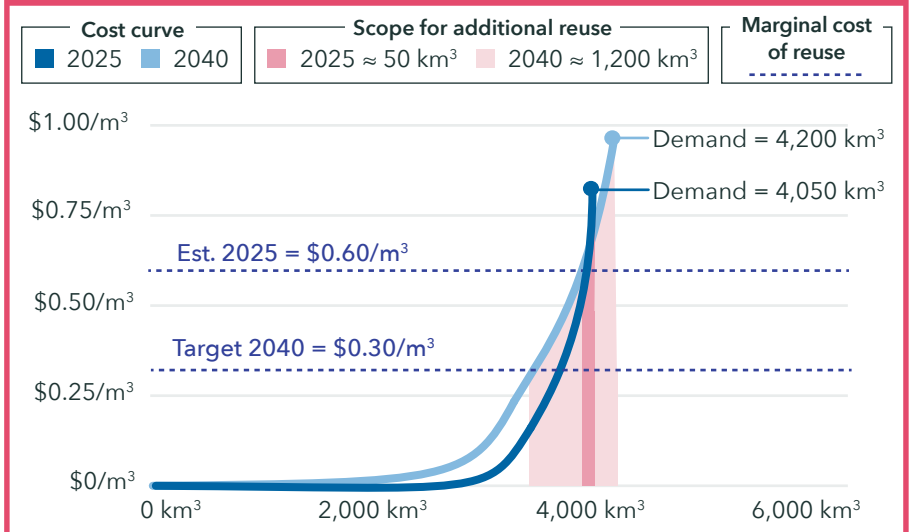
Innovation will drive down the cost of reuse

GWI estimates the current global average marginal cost of water reuse to be in the region of $0.60/m³. For many industrial water users the marginal cost is likely to be in the region of $1.00/m³. This makes reuse unattractive when lower cost freshwater sources are available. It means that reducing the cost of water reuse is an urgent priority. If the UN were to agree a global ambition for water reuse, this might have a similar impact on innovation as the Net Zero target for carbon emissions (which drove a 95% reduction in the cost of solar power). The objective for water should be to cut the cost of the key process technologies involved in onsite reuse by 50% by 2040.

Partnering with cities will lower the cost of water

Recycling municipal wastewater for reuse in industry is an attractive economic proposition for both sides. Municipalities save money on the complex treatment for potable water reuse and redirect potable water used by industry for household use. Industrial water users get a ready supply of water whose quality can be tailored to meet their process needs without the political risk of competing against the local population for freshwater resources.

The estimated marginal cost of raw water is rising



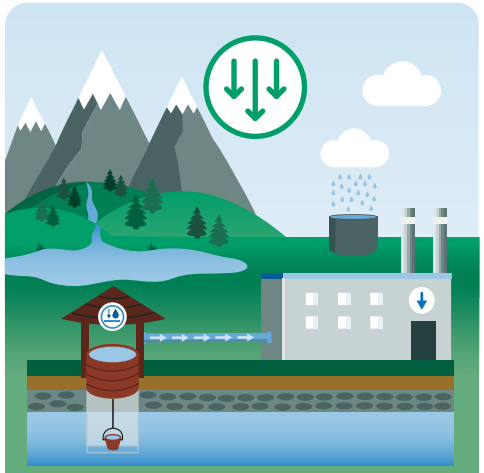
The marginal cost of raw (i.e. untreated water) rises as the lowest cost sources are exploited. Most of the freshwater abstracted from nature in 2024 is essentially free, but the cost rises as the energy and infrastructure costs related to pumping water from greater depths and distances increases. Most of the current opportunities to increase water reuse are priced in the region of $0.60/m³, which limits the current scope for the economic increase in reuse to an estimated 50 km³. By 2040, the global marginal cost of raw water will have risen as a result of climate change reducing the reliability of supplies, and over-abstraction forcing the development of new sources. It changes the shape of the cost curve. It is hoped that by that stage innovation will have cut the marginal cost of water reuse by 50%, growing the scope for economic water reuse to 1,200 km³/year.

**See Emma Charlton "This is what the climate crisis is costing economies around the world" WEF November 29 2023*

The role of reuse, recycle, and reclaim

Water conservation hierachy

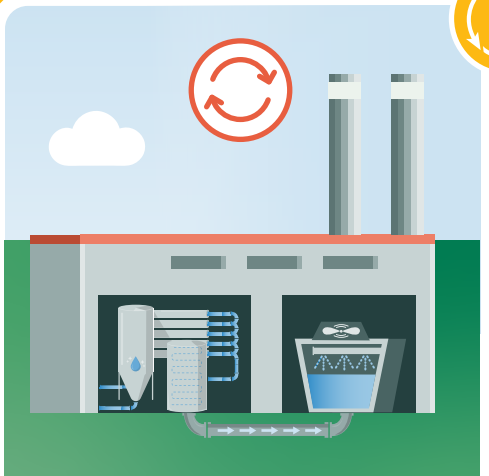
Reduce, reuse, recycle, reclaim, and replenish are just some of pathways to achieving water conservation. Firstly, companies look at opportunities to reduce the amount of freshwater used in their production processes. Only after this step will they consider reuse without treatment or recycling and reclaim, which involve advanced water treatment. Reuse is often much cheaper than recycling and reclaim and therefore the preferred option. The definitions of reuse applied by different companies are often blurry and some may use the terms reuse, recycle, and reclaim interchangeably. Reuse is often understood as a practice when water is used more than once, but the term lacks clarity on whether the water must undergo treatment or not. Increasingly, companies are also looking to replenish the amount of water they use, by developing projects with measurable volumetric benefits in local watersheds to compensate for their own operational water footprint.



Reduce ★★★ $ – $$$*

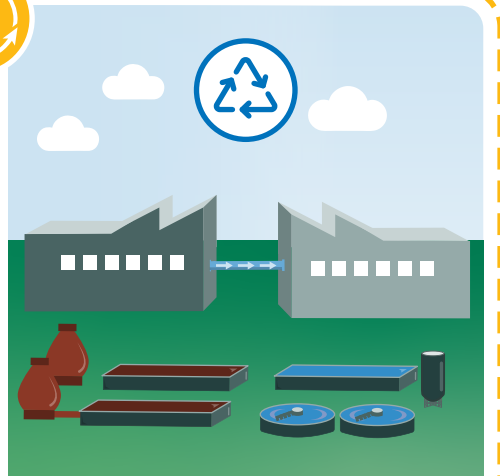
Companies **reduce the amount of freshwater** they use by identifying water efficiency measures or by using lower-grade sources of water (e.g. brackish water or rainwater) to supplement freshwater use.

**Depending on technology selection*



Reuse ★★ $ – $$

Companies reusing water multiple times can reuse, **without treatment**, in the same application or elsewhere within the factory for processes requiring the same, or a lower, quality grade.



Recycle & reclaim ★ $$$

Companies can treat wastewater for internal use within the factory or external use outside of their fenceline. The wastewater will **undergo treatment onsite** or at a local reclaim treatment plant and can then be used for more advanced processes.

Replenish ★ $ – $$$

The replenishment of water consumed or withdrawn by the company in local watersheds or other basins. The water impact of **replenishment projects** can be calculated using the Volumetric Water Benefit Accounting (VWBA) methodology.

Company preference: ★ Project cost: $

Where does water reuse take place?

From factory to supply chain engagement

There are four main categories of water reuse project, which involve different stakeholders. They all have the same objective: to reduce the amount of freshwater used during the production process. However, the implementers are different and this opens new partnership models that need to be developed for reuse to grow.

Internal reuse excellence

Increase internal onsite reuse and recycling where possible.

Examples

- Utility water reuse
- Process water reuse
- In-product water reuse
- Generating by-products from wastewater streams
- Onsite landscaping

External out-of-factory reuse

Treating factory wastewater (that would otherwise be discharged into the river) for external regional stakeholder needs.

Examples

- Irrigation for farming
- Environmental services e.g. landscaping, aquifer recharge
- Water replenishment projects

Partnering on reuse

Partnering with municipalities, industries, and other stakeholders to share recycled water.

Examples

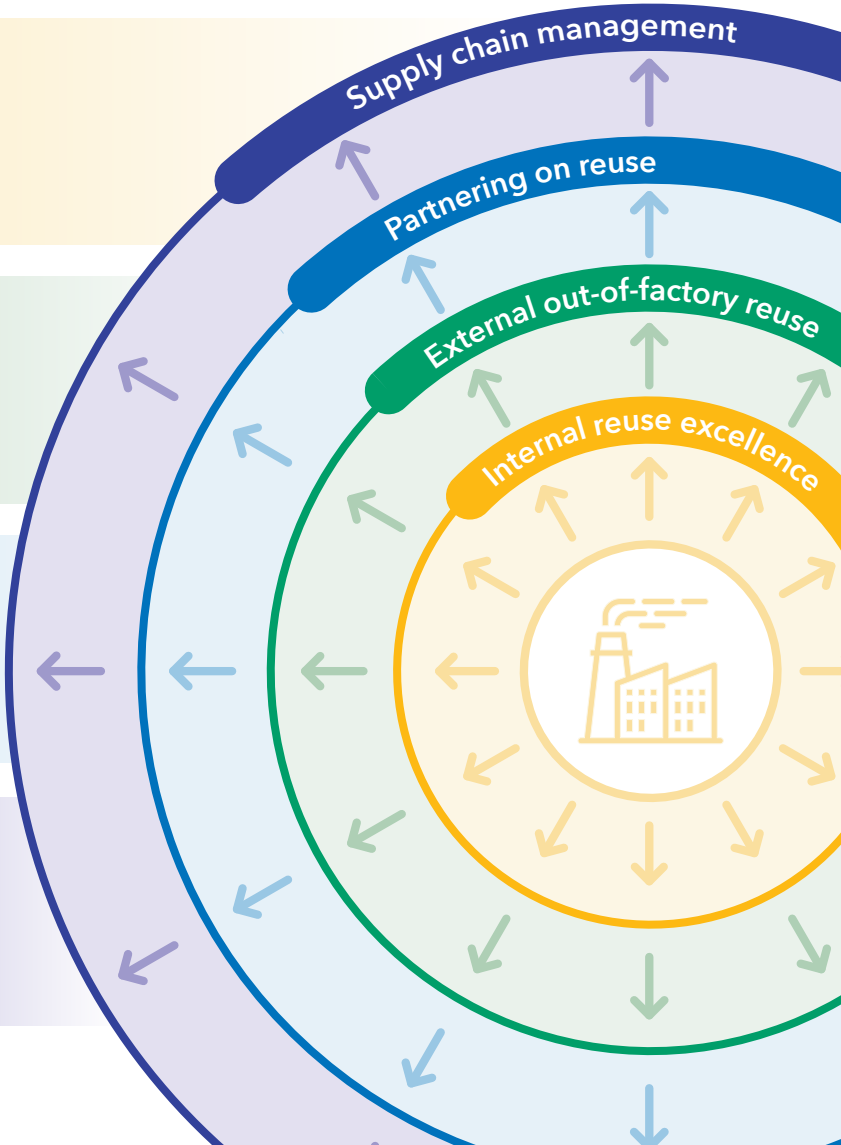
- Industrial reuse parks
- Municipal-industrial projects
- Industry-industry projects

Supply chain engagement

Working with suppliers to drive water reuse at the facilities they operate.

Examples

- Supply chain code of conduct
- Supply chain water target



Water reuse adoption at industries

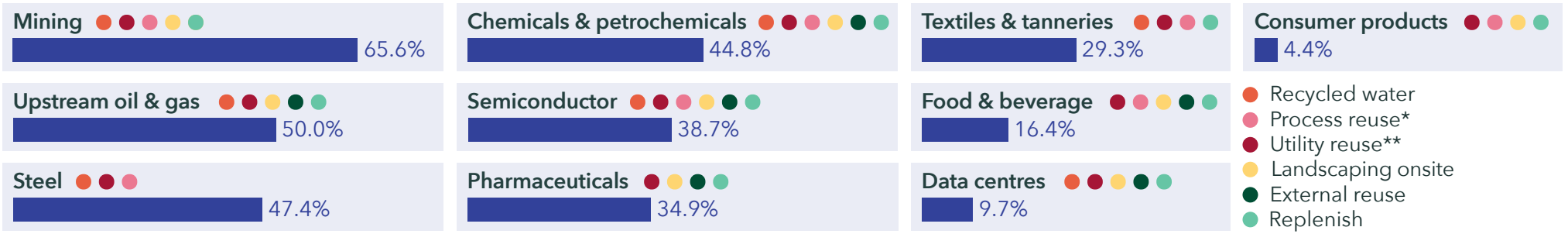
Current trends

There is no standardised way of reporting reuse volumes due to a lack of measurement, processes and consistent calculation methods. In fact, GWI research shows that approximately 60% of the top 20 companies per industrial sector do not report reuse rates at all. Either they do not measure reuse rates, or they are measured but not disclosed in annual sustainability reports.

What is a company water reuse rate?

Those companies that report reuse volumes do not typically follow a standardised calculation method, as these can vary by reporting protocol (e.g. Alliance for Water Stewardship or GRI standard) or industry specific guidelines (e.g. SEMI F98 for semiconductors, IPIECA for oil and gas or ICMM for mining). The most common issue with alignment is the fact that some companies, such as data centres or semiconductors, may include snow or rainfall capture in the calculation while others do not. Additionally, some companies may overreport water reuse, and count every reuse circle once, which has the potential to achieve a water reuse rate above 100%. Finally, some companies also show water reuse rate as a % of water consumed (withdrawal minus wastewater discharge) rather than total water used for production.

Average reported water reuse & recycling rate (top 20 companies per industry)



*Rinsing, washing, chemical reactions **Cooling, boiler feed, cleaning

Mining has the highest water reuse rates because of its large operational footprint, exposure to drought or flooding, and the need to manage large volumes of water during mineral extraction and processing. Water can be reused for dust suppression, and resource recovery practices are further driven by strict wastewater discharge regulations and a lack of freshwater in arid regions. Mining companies often work with municipalities to leverage alternative water sources, including supplying fit-for-purpose water from local WWTPs.

Consumer products on the other hand, are not thirsty industries, and practice water reuse only for utilities and process applications, never inside the product. Similarly to the food and beverage industry, reuse efforts focus on areas of high water stress. Food and beverage effluent is often of a suitable quality for offsite applications including concrete mixing in the construction industry or boosting biological process efficiency at municipal WWTPs.

Data centres also report lower reuse rates, but their consumption has been falling sharply over the past decade. The challenge for data centres is highly variable seasonal demand for cooling. This made companies focus on water efficiencies, such as increasing cycles of concentration, or upgrading of cooling systems to less water-intensive methods. To address the expected growth of the sector and associated reputational risk, companies are committing to water positive targets and building new partnership with municipalities to supply reused water.

The **textile** industry operates in areas with strict wastewater discharge regulations, such as some regions in India, driving the reuse rates up. However, the majority of textile factories have not yet installed advanced treatment technologies to reuse water, with cost a key factor.

Corporate water targets and commitments

Which targets support water reuse the most?

Corporate water targets are the biggest driver of water reuse adoption, together with water scarcity. While companies will frequently prioritise mitigating water impacts and dependencies, they often do not apply water targets in the same way across all their operations. Companies will run global water risk assessments which help them to identify site-specific business materiality and develop long-term action plans tailored to these at-risk locations.

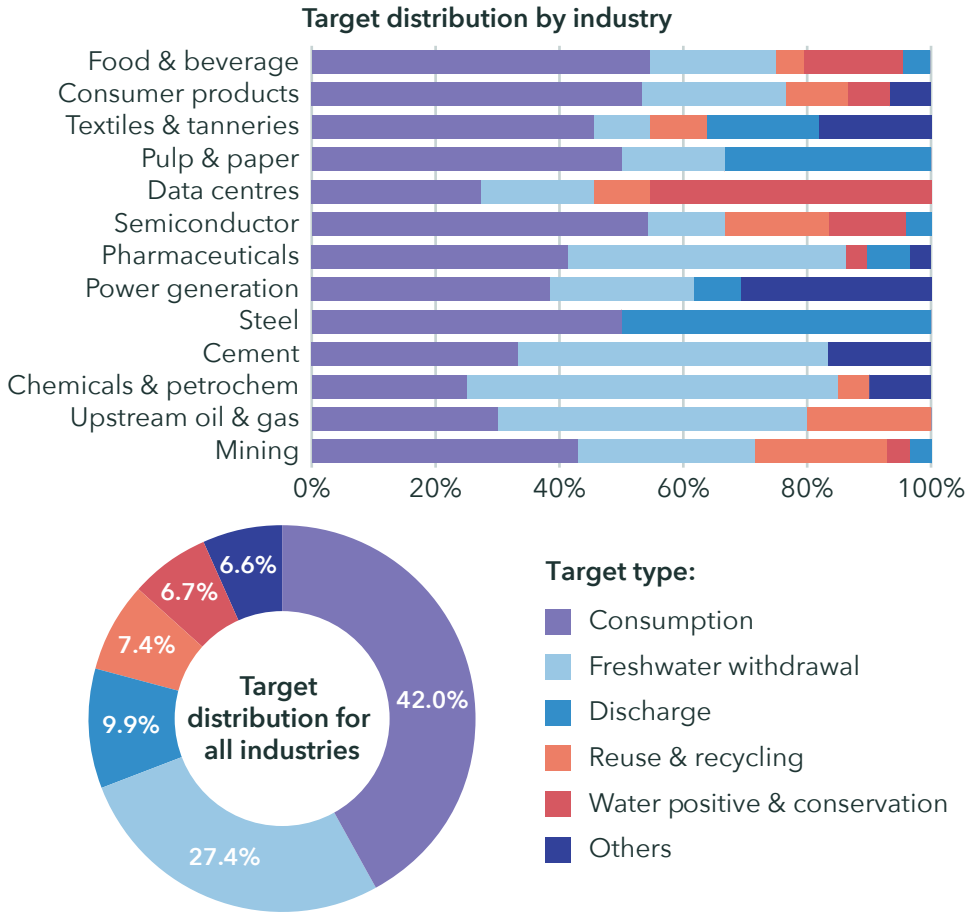
How do water targets provide powerful internal frameworks and accountability mechanisms?

Corporate water targets are an evolving landscape and there are many types of water-related targets which have the potential to impact water reuse adoption. The most impactful are direct water reuse and recycling targets, currently adopted by 7.4% of the top 20 companies per industrial sector, which define strong internal frameworks to measure, track and incentivise water reuse. Such reuse targets set either a volumetric reuse rate, for example 100% reuse for process water applications, or set management practice targets, such as requiring the installation of UF/RO systems where possible. Some companies are looking to adopt water reuse targets as a substitution for absolute freshwater withdrawal targets, because they enable companies to prove their commitment to circularity without compromising business growth.

The most common targets relate to water consumption or water withdrawal. These targets are either based on absolute volumetric reduction over a time period or an intensity measure (m^3/ton of product produced). Both intensity and volumetric targets, if ambitious enough, can be a powerful force for water reuse. They can drive companies to go further to install advanced water treatment technologies, grow external reuse or maximise use of non-freshwater sources to achieve the target.

Increasingly, companies are setting water positive or conservation targets to compensate for their freshwater withdrawal (for example, via CEO Water Mandate's Net Positive Water Impact guidance). To achieve the target, a company can choose the most cost-effective, or co-benefit generating method from either internal or external reuse options. For example, out-of-the-fence reuse opportunities could include deep-water aquifer recharge or funding a treatment plant upgrade. Data centres, together with semiconductor, food & beverage, consumer products, and pharmaceutical companies, are currently the biggest adopters of this target.

Corporate water sustainability targets overview (top 20 global companies by industry)



Obstacles to overcome

Finding solutions that fit business needs

To make water reuse work, industry must overcome a wide range of challenges spanning costs, regulatory barriers, technology adoption, social stigma and internal knowledge transfer. Companies must navigate internal guidance on reuse measurements and definitions, while being mindful of business costs, quality standards and potential risks.

Low cost of freshwater versus high cost of treatment

Every industry notes that the price of freshwater is often too low and therefore prohibitive to justifying advanced water treatment costs. The business case for water recycling installations is therefore driven by acute water scarcity and local water withdrawal permit restrictions, which threaten business continuity by not providing enough water for production.

Inadequate regulations and government incentives

Companies note a lack of policy incentives for water reuse. Across industries and geographies, companies highlight the lack of up-to-date water reuse regulations that enable water reuse practices, mainly in these areas:

Health: National regulations are too strict and may prohibit the use of reused water inside the factory due to health concerns, sometimes even for non-contact process applications.

Wastewater discharge: Overly strict wastewater discharge regulations can make a company non-compliant if they discharge salty brine from UF/RO reject as a side-stream of reuse.

Fit-for-purpose recycled water sharing: There are few guiding principles for sharing recycled water between municipalities and industries.

Lack of consistent staff expertise on water conservation

Making water conservation a priority can achieve considerable results. However, high employee turn over and knowledge loss means there is often a continuous need to re-educate new staff and prioritise simple reuse initiatives.

Technical complexities and operational expertise

As water reuse rates increase, operational issues become more complex. Companies face challenges like clogged membranes, increased maintenance requirements, and the need for more frequent quality monitoring. Companies need to train staff or hire new experts. If reclaimed water is provided externally, there is always a concern over reliable water quality and who is liable in case of production disruption.

Lack of providers of reclaimed water

Some companies might be already be open to using, or have a target to source, reclaimed water for their sites. However, there is often both a lack of municipal or industrial providers of reclaimed water and of supporting infrastructure within close proximity of the factory. Moreover, building new infrastructure is an additional barrier due to high costs.

Water-energy trade-off

Water recycling often requires additional energy, creating a trade-off between water conservation and energy efficiency. Companies must balance these competing sustainability goals.

Negative perception of recycled water

In some cultures recycled water is considered 'dirty' which prohibits the social acceptance of using such water even when it does not come into direct contact with food or other consumer products. Some suggest the need to re-brand reused water with a more socially acceptable term.

Prioritising internal reuse opportunities

The cost of water modelling

Industries that have a clear understanding of their water usage are better placed to identify opportunities for water reuse and justify its pay-back. The key lesson from many companies is to monitor water consumption and other water-related KPIs, to be able to track progress and benchmark internally and externally with other companies. The next step is to model the true cost of water per process that helps to identify where the return on investment is the highest.

How smart visualisation of water usage helps to cut costs and identify reuse opportunities

Overview

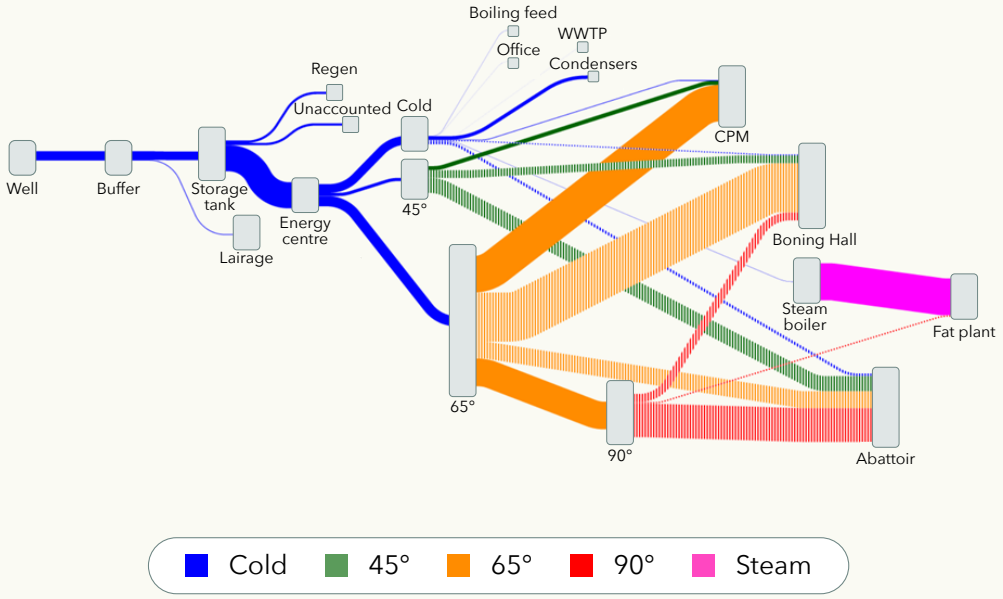
ABP's cost of water model is a pivotal tool in its water strategy. The model quantifies the financial aspects of water usage across its operations. It incorporates costs for its water at various qualities (hard, soft, treated), temperatures (45°C, 60°C, 90°C) and steam generation, as well as the cost of labour, maintenance and other consumables. By employing a sankey diagram, ABP maps water flows through its facilities, overlaying associated costs to prioritise opportunities for cost reduction instead of focusing solely on volume.

ABP is the leading Irish beef processing company, working with a network of 45,000 farmers and operating abattoirs in Ireland, the UK and Poland. ABP is also active in pet food and renewable energy.

ABP is able to...

- Reduce its water usage and reach sustainability targets.
- Enable justified investment in water-saving technologies by calculating pay-back period.
- Help operators to make better decisions about water usage in its process.
- Identify water reuse opportunities with quick return, for example:
  - The use of RO reject effluent for amenities cleaning
  - Triple washing reuse system: water from polisher is reused in the initial wash process

Internal visualisation of opportunities for water reuse



This sankey diagram helps to visualise the greatest opportunities for cost savings in various internal processes. The thicker the line, the bigger the cost associated with water use. These areas are recommended for water reuse.

Maximising internal reuse

Impactful internal strategies

Implementing water reuse reactively based on local needs achieves only marginal shifts to water circularity. Strong corporate sustainability targets, especially water reuse targets, act as a main driver to implement cultural change within the organisation and achieve circularity. Such internal corporate programs enforce rigorous planning, year-on-year target setting, progress tracking and allocation of funding for reuse projects to make water conservation a key focus area. Without strong internal drivers or economic incentives, such strategies can be difficult to implement.

L`Oréal has committed to use 100% recycled and reuse water in industrial processes by 2030

L'Oréal's policy for water management at its sites aims to preserve freshwater through a multi-disciplinary approach detailed in an action plan. Through the innovative **Waterloop concept**, L'Oréal is aiming to use recycled and reused water in industrial processes. Waterloop equipment is being deployed by order of priority of the local water context in the watersheds in which L'Oréal operates.

Status: Launched in 2017, Waterloop is operational at several of the Group's production facilities. By 2024 L'Oréal has given the internal status "Waterloop" to seven sites, with remaining factories due to upgrade by 2030.

Gradual roll-out based on the order of priority of regional water stress levels: **Italy, Russia, China, Belgium, Mexico, Egypt and Spain.**

L'ORÉAL

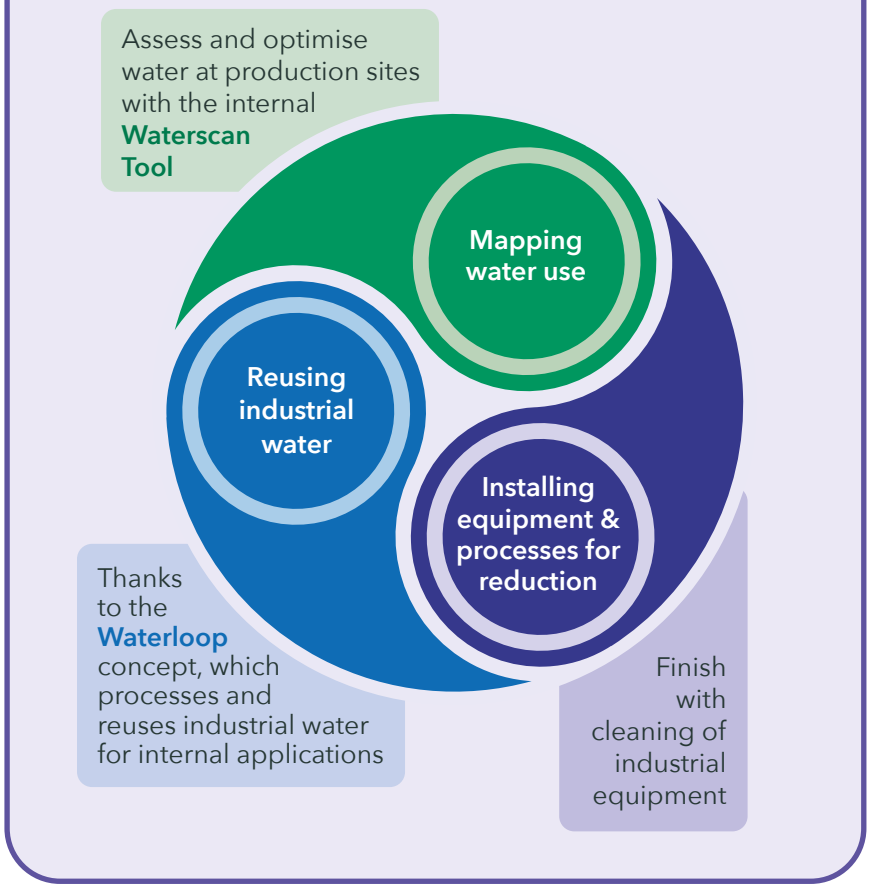
L`Oréal is a French multi-national company specialising in beauty and cosmetics products including makeup, skincare, hair and fragrances.

Method

Using water re-use and recycling techniques, Waterloop limits the amount of water withdrawal for industrial purposes at L'Oréal's production sites. In practical terms, city water is only used for human consumption and manufacturing cosmetic products, while industrial needs, such as cleaning or steam production, use water treated directly on site. This system is based on two essential pillars:

- **Process optimisation:** reducing the volume of water used in production processes
- **Reuse and recycling:** wastewater treatment using advanced technologies such as ultrafiltration and reverse osmosis, to obtain high-quality water that can be reused in industrial processes.

L'Oréal's strategy for meeting its water reuse target



Building regional water security

Farming and beneficial environmental use

Companies are increasingly exploring the development of external reuse projects as one of the ways to meet their replenishment targets and contribute to water security around their operations. Many projects are currently in the pilot stage, proving the concept that treated industrial effluent can be applied safely and reliably in different contexts. In order to scale these efforts, it is important to find suitable project partners and offtakers and establish methods of guaranteeing quality standards in order to meet local regulatory requirements.

Danone: Industry-agriculture reuse

Meknes, Morocco

Pilot: 2023–2026

Overview

Centrale Danone Morocco, in partnership with National Engineering School of Agronomy of Morocco (ENAM), is piloting the use of treated "white" wastewater from a dairy factory for irrigation.

The project's long-term success will be contingent on the technical and social outcomes.

Solution

This three-year project is designed to address the reoccuring drought challenges in Morocco and bolster the agricultural economy. Effective water governance and extensive agrotechnical studies are essential for maximising crop yield and minimising soil salinisation.

Farmers within a 5-kilometre radius of the Meknes factory are willing to adopt this alternative water source, which may encourage a shift towards the cultivation of forage crops.

Micron: Aquifer Recharge

Idaho, USA

Overview

Micron partnered with Veolia and local agencies to develop an external aquifer recharge project in response to declining groundwater levels. Water is pumped from the Boise River to Micron's site, treated, and used for aquifer recharge.

Micron partnered with Veolia to build the pump house and pipeline, to enable partial recharge into the aquifer, of which the recharge portion is 100% Micron. Micron pumps 50% of the water from the shared pump house to its site for industrial use and irrigation while Veolia pumps the remaining 50% to its surface water treatment plant. Micron also collaborates with the Idaho Department of Water Resources and other local municipal bodies to monitor and manage the system.

The project allows future flexibility for Micron to pump the recharged water back out of the aquifer in compliance with their water rights.

Aris Water & O&G companies

Texas, USA

2023: pilot
2027: commercial

Overview

Aris Water partnered with Chevron, Exxon, ConocoPhilips, & Conterra to pilot test produced water treatment using thermal and membrane desalination.

Fracking in the Permian
The extraction of unconventional oil produces 4:1 water-to-oil, creating the opportunity to treat and reuse nearly 1 billion gallons of water per day that comes to the surface. The process treats all contaminates in the wastewater and allows it to be safely applied. The desalinated water would support non-consumptive agriculture, industrial uses, and environmental restoration.

Commercial application of the project depends on local regulatory updates.

Municipal-industrial partnerships

Avoiding using freshwater

To avoid withdrawing valuable freshwater, more companies are partnering with municipalities and other industries to reuse wastewater. The water must meet quality standards for the second user. The 'fit-for-purpose' water is either directly shared untreated or treated on industrial or municipal site for to end-user specification needs (e.g. for cooling, steam generation). It is used by sectors like data centers, power, mining or petrochemicals, and shared betweenindustries, for example from food & beverage to cement. Companies either pay a fee for recycled water or co-finance municipal WWTP upgrades to secure long-term water supply contracts.

How CEMEX is building partnerships in Mexico to stop using freshwater

Overview

The nation-wide strategy started in 2015 but it was adopted more widely only after the drought crisis in Monterrey in 2022, where the bigger interest from shareholders in recycled water started.

Solution

In 2022, CEMEX successfully boosted the supply of non-potable water (suitable for drainage or agricultural use) from local waste water treatment plants to its concrete production facilities, achieving a remarkable increase from 15% to 100% in just eight months across 20 factories to exclusively source recycled water.

In 2025, there are185 concrete plants using alternative water which leads to 60% of water use from alternative sources.

The practice was extended to other regions in Mexico, and led to the development of a country level target to achieve 80% non-freshwater use by 2030 in Mexico. The practice includes industry-industry partnerships with local F&B companies, who donate their brine effluent (Danone, Pepsi, Coca-Cola, Grupo Modelo).

The proximity of partnering companies is the key success factor as transportation accounts for 80% of the water costs.

The partnership with municipalities is also dependent on the update of local regulations that allow the sale of non-potable water to industrial clients.

How Miami-Dade county set an ambitious 60% water reuse target

Overview

The Clean Water Recovery Centre (CWRC) at Turkey Point exemplifies a successful private-public partnership, providing a cost-effective water reuse solution that benefits Miami-Dade County and Florida Power & Light Company (FPL) by achieving significant environmental, financial, and community benefits. The advanced reclaimed water treatment facility helps Miami-Dade County meet Florida's Ocean Outfall Legislation requirements that requires 60% reuse from wastewater treatment facilities, reducing environmental impact and conserving the Floridan Aquifer, delivering clean, reliable energy to county residents for generations.

Treating an **average of 10 million gallons of wastewater per day**, with the potential to reclaim up to 15 million gallons, the initiative moves Miami-Dade closer to its **goal of reusing 60% of its daily wastewater flows**, targeting around 117 million gallons per day.

This comprehensive water reuse project exemplifies a circular water economy by conserving groundwater and supporting sustainable water management. Partially powered by zero-emissions solar energy, the CWRC highlights the importance of sustainable resource management and collaboration. Notably, the CWRC was completed in just two years, from design to commissioning, demonstrating the efficiency of the EPC mechanism in developing infrastructure projects.

Technology

The CWRC features advanced treatment processes including a BNR reactor, secondary clarification, filtration, and chemical treatment, along with a solar PV array for partial power. An 8-mile, 42-inch diameter waterline transports the reclaimed water, which is used to cool the five natural gas power generators at the Turkey Point campus.

Industrial parks

Sharing treatment needs between regional players

Industrial wastewater treatment parks are gaining interest in urbanised areas with high industrial activity and environmental challenges like water scarcity and pollution. They help industries to secure a long-term water supply and comply with regulations while minimising their ecological footprint. Their advantages include cost-effective resource recovery at scale, easier deployment of advanced treatment technologies, and the ability to outsource water operations. However, they are best suited for industries with similar wastewater characteristics.

Aquapolo Ambiental

São Paulo, Brazil

Overview

Established in 2012, Aquapolo is the largest water recycling facility in Latin America, supplying the Capuava Petrochemical Complex for cooling and steam generation needs.

Status: Active
Capacity: up to 1,000 l/s

Drivers

Climate change, urbanisation and the growing municipal water demand in the São Paulo metropolitan area and securing reliable water availability over the long-term.

Solution

Innovative sustainability partnership: an agreement with a brewing company to use their wastewater to feed the site's bioreactor if needed.

Strict water quality guarantee To create the specified water quality the operators blend the water from bioreactors and UF (75%) and RO (25%) together. They measure 35 water quality parameters, 4 of which are measured online (pH, conductivity, turbidity, chlorine dioxide residue). Operational availability almost 100% of the time.

Offtakers:

- Air Liquide
- Braskem
- Bridgestone
- Cabot
- Hydro
- Oxiteno
- Paranapenema
- Vitopel
- White Martins

Contract agreement with petrochemical complex A 42-year take or pay contract (minimum: 300 l/s; average offtake: 450 l/s). Payment structure is set based on the volume used: the more they consume the less they pay.

Ownership & infrastructure GS Inima Industrial (51%) and Sabesp (49%). Project cost appx. $100 million in 2012 (10% of upfront payment and 90% in 18-year debt using contract receivables as collateral).

CHERISH2O

Chemical industry water reuse in a sustainable harbour

Pilot project start: 2024

Objective:

Investigate large-scale purification and reuse of industrial wastewater to reduce freshwater withdrawal

Long-term goal: Achieve full water recycling by companies in Flanders by 2040.

Total project cost: Approx. €730,000, co-funded by project partners & Blue Deal Funds from the Flemmish government.

Participating companies
Ashland, BASF, Bayer, Borealise, Envalior, Evonik, ExxonMobil Ineos, Lanxess, 3M, Monument Chemical, TotalEnergies

Supply chain engagement

Acting where the majority of corporate water footprint occurs

Companies are aware that most of their water footprint comes from from their supply chain rather than direct operations. Some develop a detailed understanding of supply chain locations and water management practices to actively work with their suppliers on reducing their water impact. Companies typically include water management requirements in the Suppliers Code of Conduct, but these documents typically do not go as far as mandating water reuse or target setting. However, some companies starting to develop their targets specifically for reuse or including their supply chain among their global targets are driving innovation in this space.

Apple's Supplier Clean Water Program

Overview

Launched in 2013, the initial screening included surveying 2,000 primary 'Apple-managed' suppliers. The final 242 suppliers were selected based on water risk assessment results conducted using WRI`s Aquaduct dataset.

Action

Apple provides training (via external partners) to map supplier factory water usage, which serves as a blueprint to identify reuse and recycling opportunities. Suppliers are ranked on a Water Reuse Scorecard, but no preferential treatment is given to supplier based on the results.

42% reuse rate across 242 supplier facilities, saving over 76 billion gallons of water since 2013.

Target: Expand and grow supplier participation in the Supplier Clean Water Program, prioritising high water use in high water stress locations and driving participants to 50% water reuse rate by 2030.

Apple supplier responsibility standards apply to all suppliers doing business with Apple. Though not specific to water reuse, they push for operational excellence for process and wastewater treatment and maintain strict standards globally.

H&M Group's supply chain are driving water conservation

Overview

Since 2023, H&M have collaborated with suppliers involved in wet processes to implement best practices in water management, focussing on advancing water recycling, efficiency and supporting suppliers in adopting sustainable water practices.

Action

In 2024, H&M invested in waterless dyeing technology at its suppliers Arvind in India and Chorka Textile in Bangladesh. At Arvind, the SUPRAUNO technology enables waterless textile dyeing, reducing water, energy and chemical use. At Chorka, Plan Sero, a cluster of advanced technologies, is being deployed to minimise waste and potentially halve greenhouse gas emissions and water use.

In 2024, almost 20% of water consumed in tier 1 and tier 2* production factories was recycled, with absolute freshwater consumption decreasing by 9.5% compared with the 2022 baseline.

Water recycling projects

To reduce freshwater dependency, H&M Group and Primark (project lead), alongside consortium partners, are implementing a water recycling project at Fakir Knitwear Ltd. under the Sustainable Manufacturing and Environmental Pollution Programme (SMEP). Set for completion in 2025, this initiative will provide key insights into the business case for water recycling in high intense freshwater consumption regions such as Bangladesh.

Target:

- Reduce absolute freshwater consumption in tier 1 and 2 factories by 30% by 2030, with a milestone target to reduce by 10% by 2025.
- Improve water efficiency through optimised production processes, advancing the recycling and reuse of treated wastewater, and pilot innovative technologies for reducing water usage.
- Meet the broader goal of sustainable water usage, enhancing water efficiency while minimising negative impacts on people and the planet across operations.

**Tier 1 are the companies H&M Group does business with directly and works with for product manufacture or processing. Tiers 2 and beyond are companies that are working with component production and processing.*

Generating by-products

Building closed-loop water treatment facilities

Where there are economic drivers or where zero liquid discharge (ZLD) is mandated, companies see the potential to generate by-products from concentrated waste streams. These can then be used internally in factory operations or to create marketable by-products. The greatest interest in resource recovery technologies comes from the mining, textiles, semiconductor, and oil & gas industries. For example, the textile industry is exploring dye bath recycling, which focuses on treating the first and second drops from dyeing machines which contain high concentrations of colour, salt and other pollutants. Such projects offer multiple benefits: removing pollution at the source, separating salt for reuse and making the remaining wastewater less polluted and therefore more suitable for recycling.

97% salt recovery in textile dyeing factory in India

ARVIND
FASHIONING POSSIBILITIES

Arvind Limited is an Indian textile-to-retail conglomerate, manufacturing and selling denim, woven fabrics, knit fabrics, and garments.

Overview

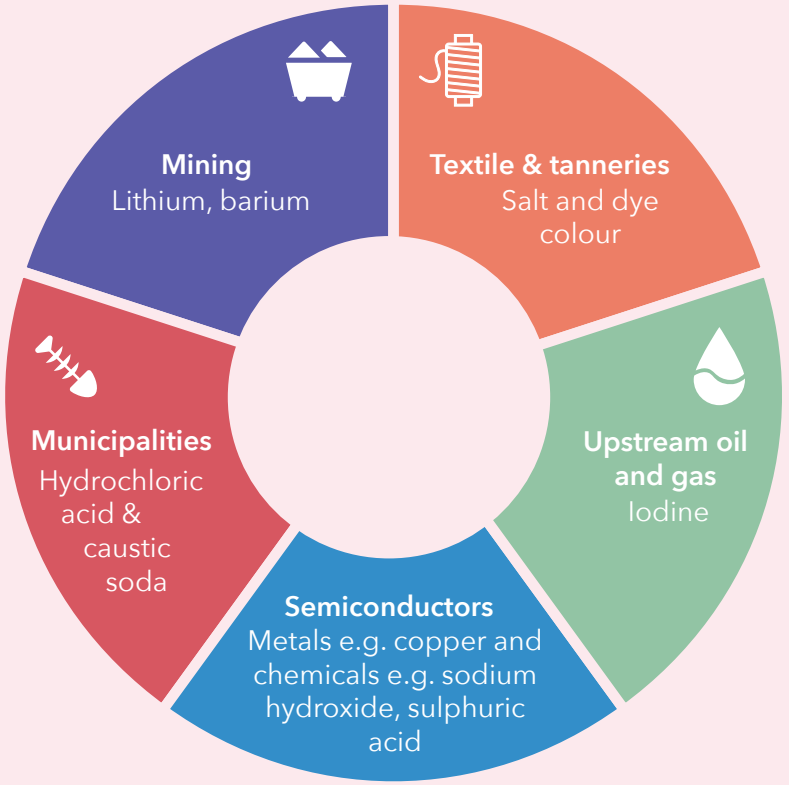
Arvind, through its strong commitment to water recycling, has built a closed-loop treatment facility near Ahmedabad. Starting in 2016, the salt recovery project yields around 50 to 60 metric tons of salt per day through the evaporation process, the majority of which is reused and reintegrated into dying operations.

Method

The facility installed state-of-the-art treatment comprising physical-chemical treatment, an aerobic biological sludge process and 4-stage RO system **which achieves a 95% water recovery.** The by-product of the evaporative system, is a highly concentrated brine, that is converted into salt.

Success: As a result, what was once a cost-center for effluent treatment has become a value-generating process.

Companies are exploring generating by-products from their waste streams, such as:



A global ambition for reuse

How it could help to scale action

GWI and the 2030 Water Resources Group have partnered to explore the development of a global target for water reuse, aiming to get a non-binding global "ambition" adopted at the 2026 UN Water Summit in Abu Dhabi. The hope is that a widely recognised global ambition will drive the company action, regulatory reform, and technological innovation needed for a water-secure world.

The vision

To minimise freshwater withdrawal by substituting industrial water needs with recycled water and driving circular water management between municipal and industrial stakeholders in local watersheds.

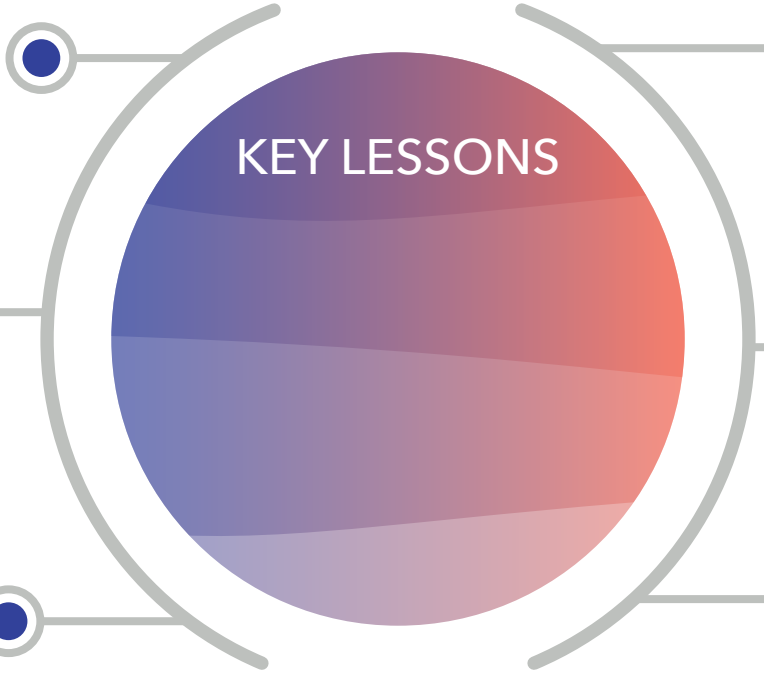
1. Assess current practices*
2. Set targets and/or key objectives to achieve with a global ambition for reuse
3. Develop implementation strategies
4. Collaborate through best-practice sharing
5. Monitor progress

**This reuse white paper interviewed 24 global companies to assess water reuse practices at their operations.*

Key takeaways

- **Companies are in favour** of the reuse ambition and would like to be invited to shape the water reuse ambition objectives, framework, governance and implementation strategies.
- For a reuse ambition to work, **it needs to provide clear alignment with other global water-related ambitions** (e.g. NPWI, SBTN) and provide practical implementation approaches suitable for varied watershed challenges. It should also focus on water-stressed areas as opposed to all operational sites.
- **The biggest barrier for companies to start implementing water circularity is the lack of reliable reuse data companies track internally.** Companies expressed the need to standardise approaches and develop internal frameworks to measure reuse. These should build on efforts already made in this area, for example guidance produced by industry-specific organisations such as SEMI or the ICMM.
- Regulatory uncertainty around reuse is prevalent in all geographies. A water reuse ambition could help to provide more guidance on updating regulations globally.
- If the reuse ambition focuses on volumetric targets, it would be desirable to **run industry-specific group meetings** to establish tailored targets for different sectors.
- Companies expressed the need for **open collaboration**, knowledge sharing and best-practice dissemination via regular group meetings. This could involve sharing insights from pilot tests or experiences operating new technologies to overcome operational challenges.

Lessons learnt



MEASURE AND BENCHMARK

To grow internal reuse, it is important to understand where water is used, how much it costs and benchmark against the specific type of production and equipment. This helps to identify opportunities for reuse at each site.

SHARE KNOWLEDGE

Water reuse is about making water visible and overcoming operational challenges. Building a strong internal water management culture and sharing knowledge of pilot projects drives reuse adoption.

BUILD ACCEPTANCE OF REUSE

Recycled water needs rebranding – internally and externally – to increase its social acceptance. Importantly, winning the internal buy-in of manufacturing health and safety teams is essential for any project to succeed.

PARTNER WITH MUNICIPALITIES

Forming strong industrial-municipal partnerships is key to scaling water reuse. Close proximity between players is important as transportation of water often contributes to the biggest project costs. For these partnerships to succeed, there is a need to design projects which meet multi-stakeholder needs.

FORM STRONG COMMITMENTS

Everything starts with a top-level commitment to drive action. Setting goals at industrial and municipal levels is an effective catalyst for the development of new reuse projects.

PRIORITISE BETTER PLANNING

Advanced water reuse requires the segregation of multiple waste streams, building storage facilities, and ensuring reliable quality control. Effective design processes can support innovation while balancing reuse project costs.

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JOIN THE CONVERSATION

Join the Scaling Water Reuse in Industry Workshop at the Global Water Summit 2025 to learn more. The workshop will include discussions around overcoming key barriers to water circularity and will explore opportunities to integrate water circularity as a core component of corporate water strategies.

Click here to learn more about the workshop.

Workshop partner

VEOLIA

Scaling water reuse in industry
Exploring the need for a global ambition

Written by: Marta Ceadel & Christopher Gasson
Forewords by: Joanne Emerson Taqi & Zeynep Erdal
Publisher's note by: Christopher Gasson
Edited by: Charlotte Oakes & Jess Chapman
Proofread by: Jess Chapman & Sebastian Hancox
Designed by: Amélie Robert

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Media Analytics Ltd.,
Suite C, Kingsmead House,
Oxpens Road,
Oxford OX1 1XX,
United Kingdom

Tel: +44 1865 204 208
Fax: +44 1865 204 209

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