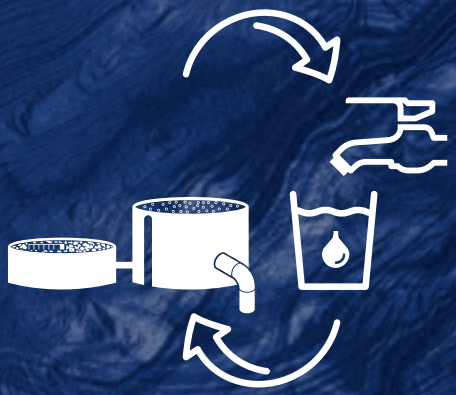
VEOLIA

ACCESS TO WATER AND SANITATION



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01

INTRODUCTION

HUMANITY HAS NEVER FACED AS **MANY CHALLENGES** AS IT DOES IN THE **21ST CENTURY**

We live on a planet we have not cared for properly.

And now we are paying the price. If the extreme weather events battering every continent are the most visible scars, other equally fearsome challenges need tackling during the coming two decades. With the clock now running on the climate emergency, access to water and sanitation plays an essential role in terms of public health, social equality, food resources, the fight against pollution, urban spread, rapid population growth, regional resilience and resource scarcity.

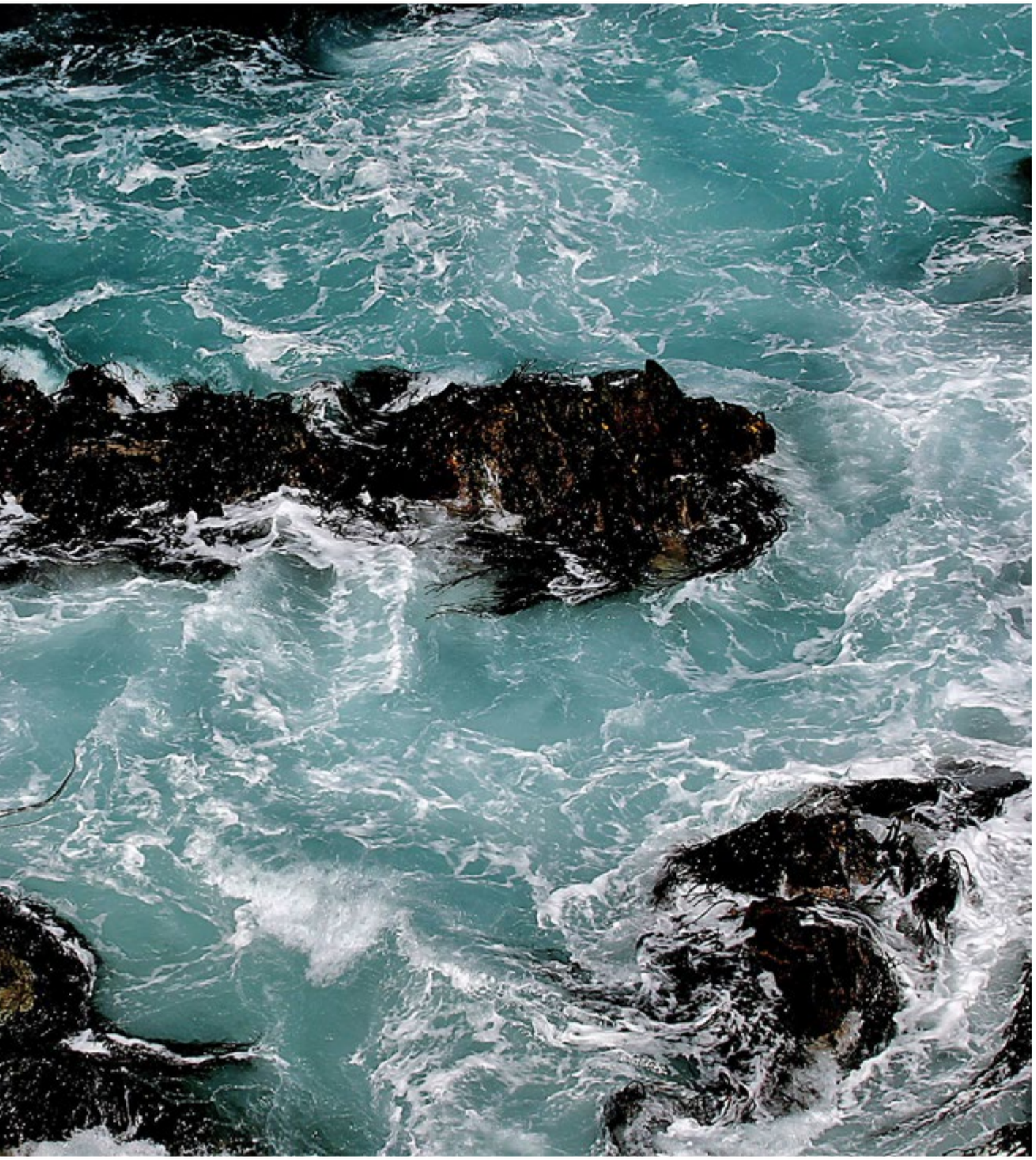
01 — Introduction

In strictly practical terms, in 20 years' time there will be nine billion people on earth, all of them needing homes and food; the rise of the global middle-class and digital technologies will increase energy needs by 30%; rampant urban spread will continue to swallow farmlands that are already heavily degraded; proximity between untamed natural environments and urban spaces will increase the risk of new viruses being transmitted to humans; rising temperatures and pollution will make life ever harder in megacities where population densities will continue to increase; resource scarcity, foremost of all for freshwater, "blue gold", will cause major conflicts between users, destabilizing entire regions across the planet, and so on. These are just some of the planetary challenges that Veolia seeks solutions.

In 20 years' time ***there will be nine billion people on earth.***

Tackling these challenges is critical: they have shown us that our lifestyles are untenable and that we need to change them right now, humanity cannot go on living in the same way. There is no turning back. Our world is different now, and we must adapt. Unless we act now, circumstances that seem exceptional today will become the norm tomorrow. We have to take stock and act collectively.

The rise of the global middle-class and digital technologies ***will increase energy demand by 30%.***



BECAUSE **ALTERNATIVE SOLUTIONS** EXIST

Veolia's resolute commitment to ecological transformation means that it can respond to the highly complex equations that condition tomorrow's world.

Veolia has adapted its business activities, in water, energy and waste management, so it can better support its stakeholders in their own transformations. So that everybody can join forces. Because nobody, in isolation, can tackle all these challenges while also preserving natural resources and combating the climate emergency.

Against this worrying background, water, the number one marker of climate change, is central to every challenge: 90% of natural disasters are caused by, or have an impact on, water resources. So, the water and sanitation activities are central to the ecological transformation that is vital if we are to move to lower carbon lifestyles.

The following pages show how these activities actively contribute to building a more sustainable world, and how they leverage innovation to roll out new solutions for tomorrow.

90% of natural disasters
are caused by water resources.

In tackling the various challenges it faces while also delivering the best service, the access to water and sanitation activity has to take account of an ever-increasing number of criteria:

technical, institutional and regulatory as well as financial, social and environmental. We think of water as a set of interdependent challenges. Only with this comprehensive, holistic and inclusive approach can we meet all the needs, today and in the future.

GENEVIÈVE LEBOUCHER

Director,
Access to Water and Sanitation

VEOLIA SERVING THE PLANET

Veolia trials alternative solutions and deploys innovative mechanisms for providing access to water and sanitation. The goal is to reduce the environmental impact of human activities, preserve water resources and protect biodiversity.

02

PREVENT

NEW FORMS OF WATER POLLUTION TO CREATE HEALTHY LIVING CONDITIONS

Water pollution perfectly illustrates the new challenges that Veolia responds to.

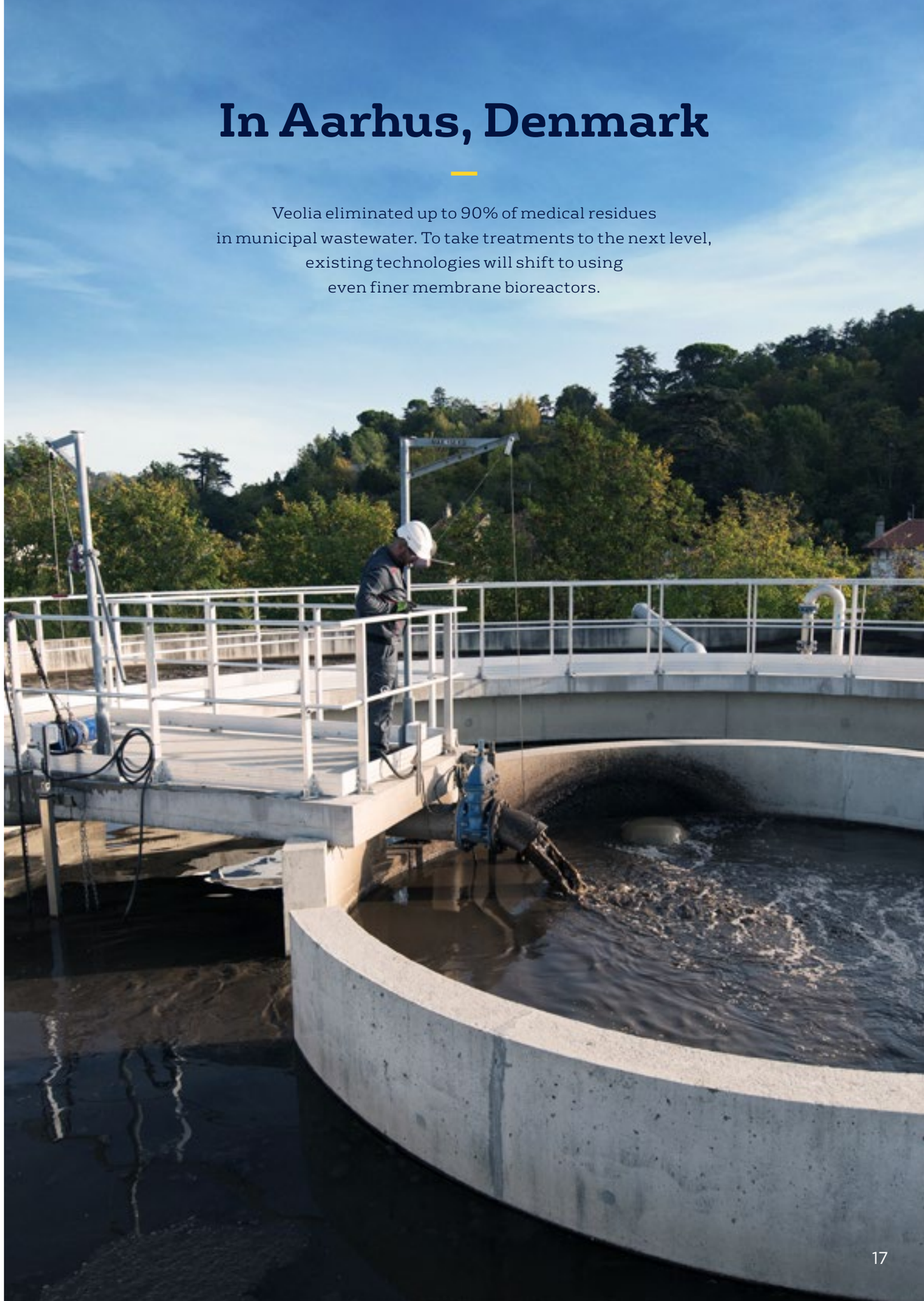
With treatments for mass pollutants now fully understood, today's challenges center on tackling new forms of pollution linked to micropollutants and plastics.

Micropollutants are dispersed toxins present in water in small quantities: pesticides and herbicides from agriculture, toxic products used in daily life (household products, solvents, plasticizers, etc.), pharmaceutical products (medicines), etc.

Of all these residues, the presence of pharmaceutical residues in water is certain to increase in the years ahead, driven by longer lifespans and increasing access to healthcare. Veolia is testing new technologies for treating pharmaceutical residues in wastewater that are more efficient and less costly.

In Aarhus, Denmark

Veolia eliminated up to 90% of medical residues in municipal wastewater. To take treatments to the next level, existing technologies will shift to using even finer membrane bioreactors.



TRANSFORM WASTEWATER INTO **ALTERNATIVE ENERGY**

Veolia thinks of wastewater not as waste but as a resource. Current technologies mean Veolia makes energy savings by recovering heat from wastewater, creating a virtuous circular economy loop.

In the south of France

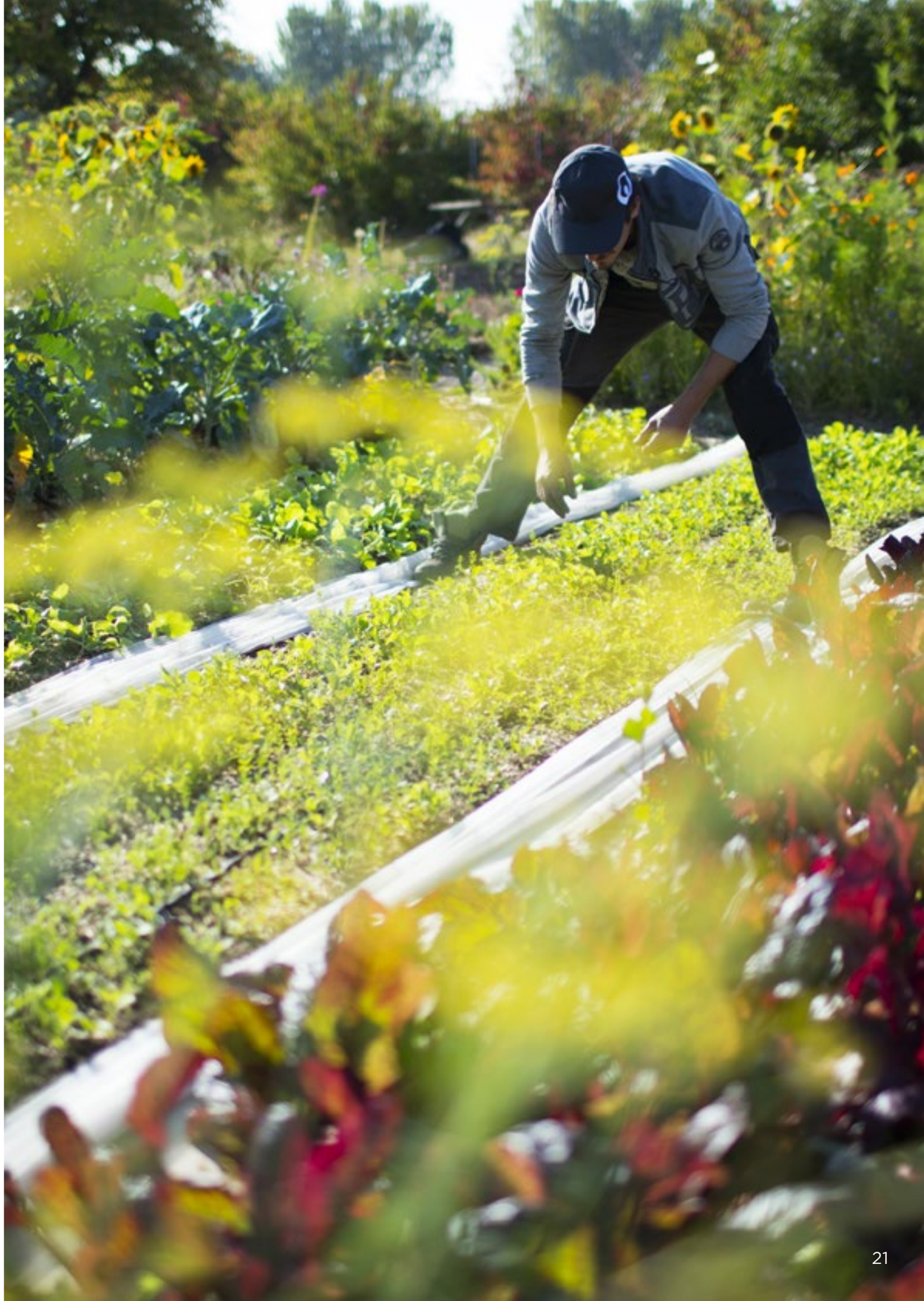
Every year, Veolia uses Energido, a solution that recovers heat from wastewater, to heat water in the swimming pools at the famous Cercle des Nageurs de Marseille to 27°C. This avoids the emission of 230 metric tons of CO_2 every year.

PRESERVE WATER RESOURCES BY IMAGINING THE AGRICULTURE OF TOMORROW

Today, 70% of all water extracted worldwide is used in agriculture.

This results in considerable environmental damage as well as conflicts surrounding water use that can ultimately lead to regional instability. Farming practices need to shift to models that are less reliant on freshwater, helping to preserve water resources.

Against this background, Veolia is taking decisive actions. All around the world, it is supporting food-processing businesses to optimize their water cycle.



In Lagos de Moreno, Mexico

It partnered with Nestlé as part of project Cero Agua, developing a solution to recover water from cow milk. It is then used on-site in the production of powdered infant formula. An identical system is also used at Nestlé's Mossel Bay site in South Africa.

In Qingdao, China

In another application for Nestlé centering on producing powdered milk and dairy products, Veolia designed and built a “zero water abstraction and use” plant to reduce risks of water use conflicts.

PROTECT
BIODIVERSITY

Veolia supports its customers in their ecological transformation.

Determined to combine environmental protection with economic and social development, Veolia supports its customers (industry for example) in their ecological transformation, helping them to optimize and secure the future of their activities. In practical terms, the access to water and sanitation business activity helps its customers to adapt their business models and bring circularity into their organization and processes.

At Gardanne, in the south of France

Veolia helped to avoid the closure of an industrial site operated by Alteo. Effluent discharges into the Calanques marine park and the Mediterranean failed to meet quality thresholds, but Veolia was able to design a sustainable solution. A biological treatment unit was put in place. The idea is that bacteria are used to degrade organic matter in suspension. The result is that discharges from the plant now meet the strictest standards, helping to protect 60 marine species living in the waters of the marine park.

VEOLIA SERVING RESIDENTS AND REGIONS

Water is vital to all our lifestyles. It is also central to many business activities, from agriculture to construction, and energy services.

2.4 BILLION

people have
no toilet

40%

worldwide freshwater
shortfall by 2030

80% OF WASTEWATER

is discharged untreated,
directly into rivers and seas

03 — Veolia serving residents and regions

One in three people on planet earth live without access to safe water and sanitation.

About 2.4 billion people have no toilet. Over 80% of wastewater is discharged untreated, directly into rivers and seas. By 2030, there will be a 40% worldwide freshwater shortfall, impacting the lives of 1.8 billion people.
The figures are as stark as the reality: water and sanitation infrastructures are lacking in the places where people need them most.

Responding to issues surrounding access to water, social equality, cleanliness and hygiene, regional resistance and resilience, is a task of unparalleled complexity. Veolia takes an integrated approach, more comprehensive and holistic, to managing water and sanitation. It always aims to create ever more sustainable and inclusive solutions that combine expertise in water, energy and waste.

***Water and sanitation infrastructures are lacking** in the places where people need them most.*

PROVIDE ACCESS TO WATER AND SANITATION FOR ALL

A water and sanitation service is, by definition, inclusive.

Irrespective of the location and specific features, it offers everybody a chance to access safe water and sanitation at an affordable price. In many parts of the world, switching from bottled water to tap water, for example, is a step-change in terms of public cleanliness, affordability and living conditions.

A water and sanitation service is also inclusive when it takes account of related consumer concerns in its responses: health, environmental protection, hardship. For the most vulnerable groups, people not covered by contracts signed with municipalities, Veolia always takes account of the enduring nature of informal settlements that often cluster around larger cities. A process of intensive discussions with town halls is used to invent solutions for reaching out to these disadvantaged groups.

In Guayaquil, Ecuador

Veolia rolled out a project known as Agua del Sinaí. The 130,000 residents of Monte Sinaí, an informal settlement, now benefit from a low-cost drinking water supply when previously they had trouble securing access to water.

Between 2000 and 2016, in countries with a water-access shortfall, Veolia connected over 7.2 million new consumers to a drinking water supply, and over 3.3 million to a sewer network.

In different regions of the world, Veolia will install street-side tap stands for locals, run tanker deliveries or, as in France, distribute water vouchers to those most in need.

In Nagpur, India

Veolia provided 6.5 million people
with access to drinking water
and 3 million with access to sanitation.

COMBAT DISEASE

By bringing water closer to where people live and dealing with wastewater on a daily basis, Veolia promotes cleanliness and hygiene.

The simple fact is that washing hands can prevent, control or even eradicate disease. In this way, Veolia plays a major role in delivering public health policies and, via its technologies, it makes a full contribution to societies' economic and social development.

In France

Faced with the Covid-19 pandemic, Veolia created Vigie-Covid-19. The system provides an early warning if traces of the virus are present in wastewater. It makes it possible to track circulation within a local area and to plan for the future epidemiological situation and demand on hospital beds. The product's capabilities were then extended to include identification and quantification of variants, working in collaboration with IPMC – a joint research center run by the French National Center for Scientific Research (CNRS) and Côte d'Azur University – and IAGE – a Montpellier-based company specializing in environmental biological analysis.

PROVIDE A HOLISTIC VISION SUITED TO DIFFERENT TERRITORIES

On the ground, managing services for access to water and sanitation has become extremely complex.

In the face of numerous competing challenges, considerations to integrate now include, among others, cultural, social, financial, health and environmental factors. To minimize impacts on resources, Veolia looks at the complete local ecosystem and puts forward the most suitable solutions in terms of the constraints that may apply.

Sometimes this will involve dealing with problems upstream, for example collecting hazardous industrial effluent and treating it at specialist plants to control the quality of water discharged into the sewer network.
This holistic vision is all the more critical in today's world, where systems are involved at every phase of the water cycle: first it is abstracted, then treated, used and retreated before, finally, being recycled or returned to the natural environment. And at every phase, advances made by Veolia's research and innovation efforts are underpinned by years' of experience gained through each of its contracts. Everything is permanently interconnected using digital technologies. Hubgrade, the smart monitoring solution designed by Veolia, makes it possible to direct the service's performance in a process of continuous improvement.

From this standpoint, one of Veolia's strengths is that it allows local authorities to optimize resource usage and the cost of water and sanitation, leveraging benefits from an outstanding customer portfolio.

In Hamamatsu, Japan

Veolia won the country's first long-term (20-year) concession contract in 2018 for running a municipal wastewater service.

In Bucharest, Romania

Which faced a particularly severe set of challenges, between 2014 and 2019 Veolia's Apa Nova subsidiary reduced non-revenue water (water lost before reaching the consumer) by 9%.

SUPPORT **REGIONAL RESISTANCE** AND **RESILIENCE**

2030 will see twice the number of flood victims as 2020.

In the face of crises and natural disasters of increasing frequency and severity, Veolia works with territories, in fields that go beyond just access to water and sanitation, to help them adapt to the new realities. In the wake of a hurricane or flood, restoring public services as quickly as possible is obviously a priority. But to help take things further, Veolia also assists with forward planning to prevent the consequences of disasters and crises. This response seeks to plan ahead for risks, measuring and ensuring the robustness of local authorities. It is designed to assist in implementing resilience strategies.

***Veolia also assists with** forward planning to prevent the consequences of disasters and crises.*

To achieve this, teams from Veolia work closely with territories and grassroots actors, explaining and educating about ecological considerations, helping to imagine solutions to tomorrow's problems.

During major events, such as Expo 2010 Shanghai, the 2012 London Olympics, or in Paris for COP21, the 2015 Climate Agreement,

Veolia set up surveillance systems to monitor drinking water networks in case of possible terrorist attack. KAPTA 3000 sensors offer real-time monitoring of water quality in smart networks, providing an instant alert in the event of a discrepancy. There are currently 550 sensors operating around the world.

Near Paris, in France

In the Bièvre river valley, water levels are constantly monitored by an automated system to prevent flooding. Water flows in the Bièvre and its regulating system are continuously assessed, with rainfall gauges and a flood forecasting tool installed to pinpoint areas likely to be affected during a crisis.

In Copenhagen, Denmark

Veolia worked with the city council to set up a management system for the sewer network and wastewater treatment plants, coupled with a system that monitors and measures water levels in retention basins located in and around the city's green spaces. This complex sewer system provides the city with a flood warning capability.

04

INVENTING TOMORROW: CENTRAL TO EVERY VEOLIA INNOVATION

Veolia's access to water and sanitation activities are currently undergoing far-reaching changes to enable them to better reflect the new challenges it has to tackle.

Tomorrow's water service will be one that consumers have chosen. A service close to their concerns, offering constant quality without variation, aligned with their needs and convictions. A service with zero carbon impact that offers positive benefits in areas beyond water and sanitation, such as the production of clean energy or improved regional resilience.

A SCALABLE SERVICE OFFER **SUITED** TO **EACH TERRITORY**'S NEEDS

In France, Veolia is in the process of extending its offer of services to reflect the preoccupations of its stakeholders, local authorities as well as residents and consumers. Different service tiers are possible for each dimension of a service, reflecting local variations in customers' expectations (in terms of tastes, comfort, savings, etc.) and convictions (environmental protection, etc.). This approach means that local needs can be met in full for every dimension of a service. And because every local authority has different needs and expectations, some of the variations are described below.

*This approach means that local needs **can be met in full for every dimension** of a service.*

04 — Inventing tomorrow: central to every Veolia innovation

An authority might opt for a robust service that provides continuity of service, is affordable for all and meets all legal and statutory requirements. This service provides an initial tier of services, optimized to meet all applicable standards.

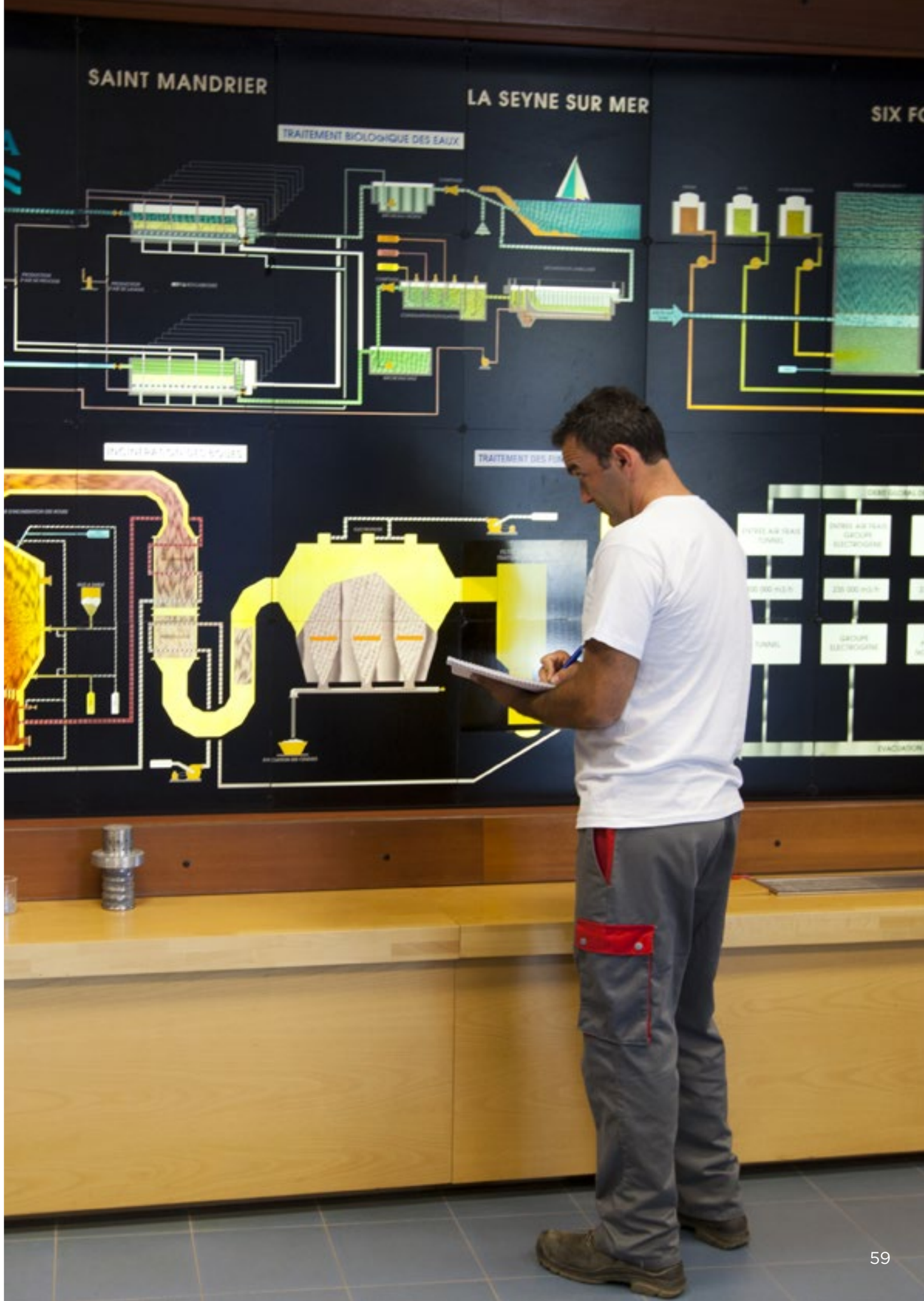
Another authority might want a service that includes a strong commitment to a lowered environmental footprint. This service provides water that combines comfort with savings, low resource use with respect for the planet, all delivered by a service that is more socially engaged. This may take the form of collective upstream water-softening at the treatment plant. This delivers a real benefit to consumers: softer water with less limescale is better for people's skin, household appliances and bank balances, offering savings because this water takes less energy to heat. And this is an inclusive offer too, because it provides an identical service to all. In the Eure, in France, since 2017 almost 6,000 people living near Harquency now benefit from water with less limescale. Veolia fitted a softening solution, reducing water hardness from 35°f to 18°f and delivering a real boost to local people's comfort.

Other authorities will choose a class-leading service that meets residents' expectations for today and the challenges for tomorrow. This is a service that exceeds all current standards and consumer expectations in terms of taste, comfort, health and the environment. It leverages the full spectrum of Veolia's water and sanitation innovations to maximize positive impact on the environment and ecological transformation. By stopping people from turning to bottled water, this offer helps to limit the spread of plastic into the environment and cuts the volume of bottles transported long distances. Reverse osmosis membrane technologies are used to purify the water, guaranteeing a quality that exceeds statutory thresholds. This offer is completely free from micropollutants and fully softened.

The same broadening of the range of service offers is deployed in other parts of the world, in line with local expectations.

WATER TREATMENT FOR TOMORROW: **CUSTOM SOLUTIONS**

Although Veolia has made great strides in terms of access to water and sanitation, the challenges to tackle in the future are even greater. All over the world, Veolia is exploring new territories, inventing and trialing custom solutions tailored to local conditions, enabling it to perfect and deploy the new solutions needed for tomorrow.



Desalinating seawater to provide people with drinking water

In Fujairah, United Arab Emirates

Veolia built the Qidfa desalination plant, producing 590,000 cubic meters of desalinated water daily. In a country where freshwater resources are under tremendous pressure, Veolia met the local population's growing needs for drinking water and helped development of the regional economy. To provide such outstanding performance, the ultra-modern plant combines two desalination technologies: distillation and membrane filtration.

Anticipating disasters to boost urban resistance and resilience

In New Orleans, USA

30 experts from Veolia and insurance company Swiss Re worked for four months with the local stakeholders, examining 200 drinking water, sanitation and rainwater dispersal facilities in the city. The goal was to determine their degree of vulnerability and recommend appropriate actions to ensure these facilities can resist extreme events. This is an example of resilience, where weather forecasting is combined with dynamic management of stormwater drainage systems and optimization of treatment systems at drinking water plants. The end result is minimized environmental impacts with minimal water treatment.

Cleaning up water by eliminating micropollutants

In Aarhus, Denmark

Since 2014, in the Denmark's second city, Veolia has been running a trial with Skejby hospital looking into ways of treating medical residues in wastewater.

The extremely small size and concentration of these new pollutants, sometimes less than a nanometer, makes them harder to detect, analyze and eliminate. In this case, a system was put in place to trace and treat medical residues (antibiotics, contraceptives, osteoporosis and cancer treatments) in hospital wastewater. The project's scope was expanded to include the nearby Herning Vand treatment plant, as 95% of these pollutants are also found in municipal wastewater. The results are extremely favorable, with up to 90% of medical residues eliminated. In future, taking these processes a stage further, filter technologies will be revolutionized by the development of carbon nanotubes and high-permeability biomimetic membrane systems that imitate fish gills.

IMPACTFUL SOLUTION

05

REUSING WASTEWATER (Reuse): AN ALTERNATIVE RESPONSE TO WATER STRESS

BACKGROUND

Among the main consequences of the climate emergency, droughts and water shortages are a threat to water supplies. Every year, France sees limits on freshwater use imposed in many areas (87 restrictions in 2019). And if these periods of water stress concern everybody, the impacts are felt far more keenly by farmers and industrial businesses, leading to conflicts surrounding water use and increases in the cost of water. Some factories even have their consumption limited once they exceed 100,000 cubic meters annually. This in turn can put the long-term viability of their activity at risk.

In drier parts of the world, access to freshwater and sanitation remains one of the largest challenges that people face. And this is exacerbated by the fact that the planet's growing population tends to move to coastal cities. This phenomenon contributes to increasing the pressure on freshwater resources against a background of major water stress.

One of Veolia's responses to this situation is to reuse treated wastewater.

87 RESTRICTIONS

in 2019, limiting
freshwater use in France

100,000 CUBIC METERS

limitation of water consumption
in some factories in France

ADVANCED TECHNOLOGIES REQUIRED FOR REUSING WASTEWATER:

filtration, oxidation,
adsorption and disinfection

2,737

wastewater treatment plants

347 MILLION CUBIC METERS

of water reused from collected
and treated wastewater

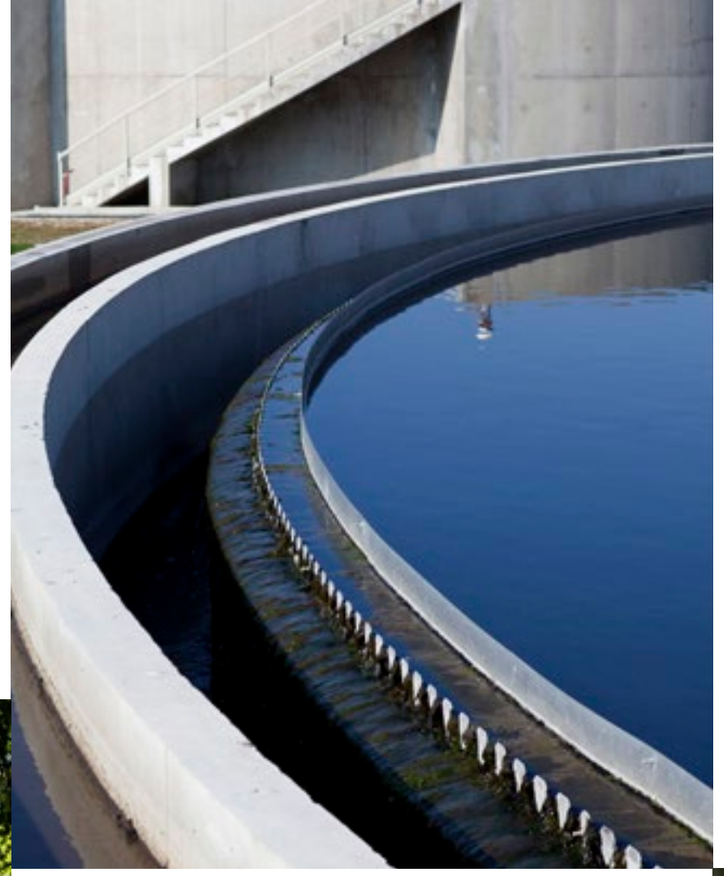
SOLUTION

Water is far too precious not to be used several times. This is the circular economy principle behind the idea of reuse: treating wastewater so that it can have a second life before being discharged into the natural environment. This water can be reused without risk, and helps to limit the amount of freshwater taken from the environment.
Today, Veolia is expert in the advanced technologies required for reusing wastewater (filtration, oxidation, adsorption and disinfection) and can tailor installations to suit the needs of each client, authority, industrial or agricultural business.

Veolia supports territories worldwide, offering them the most appropriate solutions and strategies according to the local context and ecosystem. Veolia recycles wastewater for crop irrigation and watering. As the world leader in terms of installed capacity, Veolia operates 2,737 wastewater treatment plants and, in 2020, reused 347 million cubic meters from collected and treated wastewater.
Domestic wastewater is a precious source of water and nutrients that Veolia hopes to exploit on a far larger scale.

In Abu Dhabi, United Arab Emirates

Veolia recycles 300,000 cubic meters of wastewater daily for irrigation and watering.

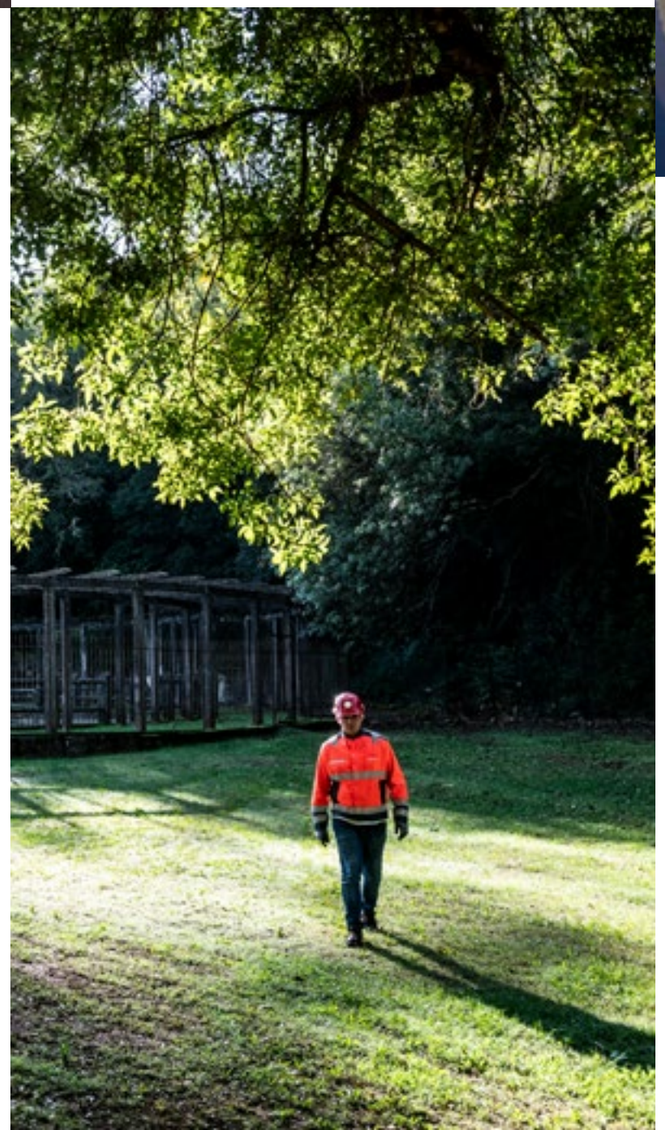


In Durban, South Africa, and Sydney, Australia

Municipal wastewater is treated and then reused by local industries such as refineries and paper mills, or to produce electricity.

In Tarbes, France

A trial is being run to grow maize and barley with reused water. An innovative research partnership on intelligent reuse has been set up with the FNSEA, a farmers' body. The water is reused and special treatments extract the nutrients it contains (nitrogen, phosphorus and potassium), which are used as soil improvers.



In Sainte-Maxime, France

Reused wastewater is used for watering and grounds maintenance; in Bonifacio, Corsica, it is used to water golf courses; in Deauville, northern France, for street-cleaning; in the Languedoc, again in southern France, for drip irrigation in vineyards.

HELP PROVIDE ACCESS TO WATER FOR ALL, DESPITE CONFLICTS OF USE

Wastewater reuse offers numerous advantages: it eases pressures on water resources, decreases conflicts between competing users, secures access to water: no more risk of supply being cut off, it often improves the carbon footprint thanks to savings in energy and water use, and ensures continuity of industrial production.

Yet despite these many advantages, this is a technology that remains in very limited use. Around the world today only 4% of wastewater is reused by industry or agriculture. Reuse projects have to overcome barriers surrounding local regulations, social acceptability and the fact that natural freshwater is underpriced. In France, less than 1% of wastewater is recycled.

In France, less than 1% of wastewater is recycled.

However, this situation must change if agriculture is to have all the water it will need in the coming decades. Some countries have woken up to this: in Israel, 90% of treated wastewater is reused, 14% in Spain and 8% in Italy. Worldwide, about 100 million cubic meters of water are recycled every day. Other countries, such as Namibia, have even turned to wastewater reuse as a way of ensuring supplies of drinking water.

In financial terms, reuse is cheaper to deploy than seawater desalination. And it is the only water resource whose availability increases in line with economic development, and that is produced in exactly the places where water tensions exist already, meaning the demand is there too.
Furthermore, in geopolitical terms, reusing wastewater can increase a country's water self-sufficiency. It gives them access to a reliable local water resource, one unlikely to be coveted by adventurous neighbors.

Around the world today only

4% of wastewater is reused

by industry or agriculture

SOME COUNTRIES HAVE WOKEN UP TO THIS

% OF TREATED WASTEWATER REUSED:

90%

ISRAEL

14%

SPAIN

8%

ITALIA

IMPACTFUL EXAMPLE

Windhoek is Namibia's capital and a resilient city. It sits in a desert location in the heart of the country. With average annual rainfall of just 250 mm and intense heat that causes the evaporation of 83% of rainwater, just 1% of water from the skies finds its way into the ground.

Yet despite such extremely limited water resources — groundwater supplies 40% of the country's needs — and strictly controlled consumption, the capital has grown constantly since the 1950s, an average of 6% each year.
In 2002, the government of Namibia decided it had to increase its water resources. It tasked Veolia with designing, building and operating the Goreangab drinking water production plant, which recycles wastewater from the Gammam treatment plant.

05 — Impactful solution

Veolia set up a technologically advanced solution with rigorous quality standards to account for the highly polluted nature of the water requiring treatment: this highly complex multi-barrier process uses a succession of physico-chemical treatments, backed by constant monitoring of water quality.

The result is 21,000 cubic meters a day of wastewater transformed into drinking water. This covers 29% of the needs of the 400,000 people living in and around the city.

This alternative solution for extending water resources both secures the city's water supplies and provides a response to major environmental challenges: it avoids excessive depletion of natural resources and significantly reduces pollution discharged into the environment.

Today, Windhoek is a global figurehead for wastewater reuse.

A powerful example of the circular economy that, over the past 20 years, has been copied in Singapore and California. The fact is that, looking ahead, the factors holding back wastewater reuse are not technical, rather they are regulatory and psychological, although the user reticence seen in the past is tending to diminish.

IMPACTFUL SOLUTION

06

ENERGY POSITIVE TREATMENT PLANTS: TREATMENT SLUDGES AND WASTEWATER BECOME SOURCES OF RENEWABLE ENERGY

BACKGROUND

Globally, towns and cities consume almost 75% of all primary energy produced on the planet. Over 78% of this is fossil energy from oil, gas and coal. Major cities account for 80% of greenhouse gas emissions. Aware of their responsibilities in terms of fighting the climate emergency, many cities are looking for ways to cut their environmental footprint by reducing their CO_2 emissions and optimizing their energy costs. They are committed to rolling out environmentally responsible solutions. Hydropower, wind, geothermal, biomass, biowaste: there are many possible sources of renewable energy.

To take things to the next level, Veolia provides local authorities with energy recovery solutions for municipal wastewater and sewage sludges. These abundant local sources are efficient levers for reducing primary energy use and producing zero-carbon energy.

And, some of today's wastewater treatment plants are actually energy positive, using less energy than the quantity of renewable energy they produce.

75% OF ALL PRIMARY ENERGY

is consumed by cities

80%

of greenhouse gas emissions
are generated by major cities

ENERGY RECOVERY SOLUTIONS

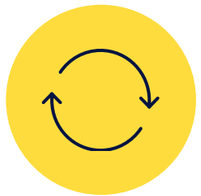
for municipal wastewater
and sewage sludges

TRANSFORMING

wastewater into a source
of thermal energy

RECOVERING

sludge for conversion
to biogas



CREATING

local circular
economy loops

SOLUTION

In order to constantly decrease its local impact and support its clients in their ecological transformation, the access to water and sanitation business activity can also offer energy production services.

The first solution consists of transforming wastewater into a source of thermal energy. In practical terms, Veolia's response consists of recovering heat energy from wastewater. Part of the municipal wastewater is routed through a heat exchanger, transferring thermal energy to a heat transfer fluid. Calories recovered in this way are routed through a reversible heat pump and the energy then used in a heating or cooling network. This ensures high energy yields at all times of year.

The second solution is to maximize use of by-products generated at wastewater treatment plants. Veolia recovers sludges that are transformed into resources, creating local circular economy loops. Sludges are recovered and methanized for conversion to biogas. This form of green energy adds value to materials that were previously discarded. This is a powerful lever for reducing residual sludge volumes, combating resource scarcity and creating new revenue streams by using the energy produced on site, or selling it to a local network.

In Arras, northern France

The municipal aquatic sports center and all water in the pools are heated with renewable energy, using calories recovered from wastewater. This provides 75% of the center's energy needs. This avoids the emission of 230 metric tons of CO_2 every year, a reduction of 60%.

IMPACTFUL EXAMPLE

To the north of Sofia, in Bulgaria, the Kubratovo wastewater treatment plant occupies a 60-hectare site and is one of the largest treatment plants in the Balkans, as well as being the most innovative. Built 35 years ago, it has constantly been updated and currently treats 500,000 cubic meters of wastewater a day from homes and industry, as well as rainwater. Better still, the site is now practically self-sufficient in energy. This is the fruit of a lengthy process of continuous improvement.

In 2009, a new combined heat and power system was installed using biogas to produce renewable energy. The aim was to optimize the plant's operation and energy efficiency to reduce its CO_2 emissions. And to boost its performance even more, the CHP system with its three cogeneration units, each capable of producing 1,063 kW of electricity and 1,088 kW of heat energy, was modernized in 2019. The updates mean all the plant's installations will reach 100% energy self-sufficiency in the coming years, making it one of the few sites in the world to operate entirely with on-site renewable energy.

Since 2009, the plant has produced 198 million kWh of renewable energy from wastewater sludges, 92 million cubic meters of biogas and avoided the emission of 1,080 metric tons of CO_2.

Since 2009
the Kubratovo wastewater treatment plant,
in Sofia, in Bulgaria, has produced

198 million kWh

of renewable energy.

KEY ACTIVITY DATA

HELP PROVIDE **ACCESS TO WATER FOR ALL,** DESPITE CONFLICTS OF USE

Veolia's historical market, with over 150 years' experience, managed water and sanitation services on behalf of local authorities are central to numerous advances in hygiene and the fight against diseases.

GLOBAL **GEOGRAPHICAL AND INDUSTRIAL** FOOTPRINT

The Veolia group provides its access to water and sanitation solutions in every part of the world:

95 MILLION

people supplied with drinking water and 62 million people connected to sanitation thanks to Veolia's facilities

REVENUE OVER €6 BILLION

50% OF THE ACTIVITY

is in France, followed by central Europe, Australia, Japan, Africa and Latin America

A BUOYANT MARKET

AROUND THE WORLD, JUST

14%

of water and sanitation services are run by private companies.

THIS MEANS THERE IS **VERY HIGH POTENTIAL** FOR FURTHER GROWTH

Veolia Communications Department
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Resourcing the world

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