MAY
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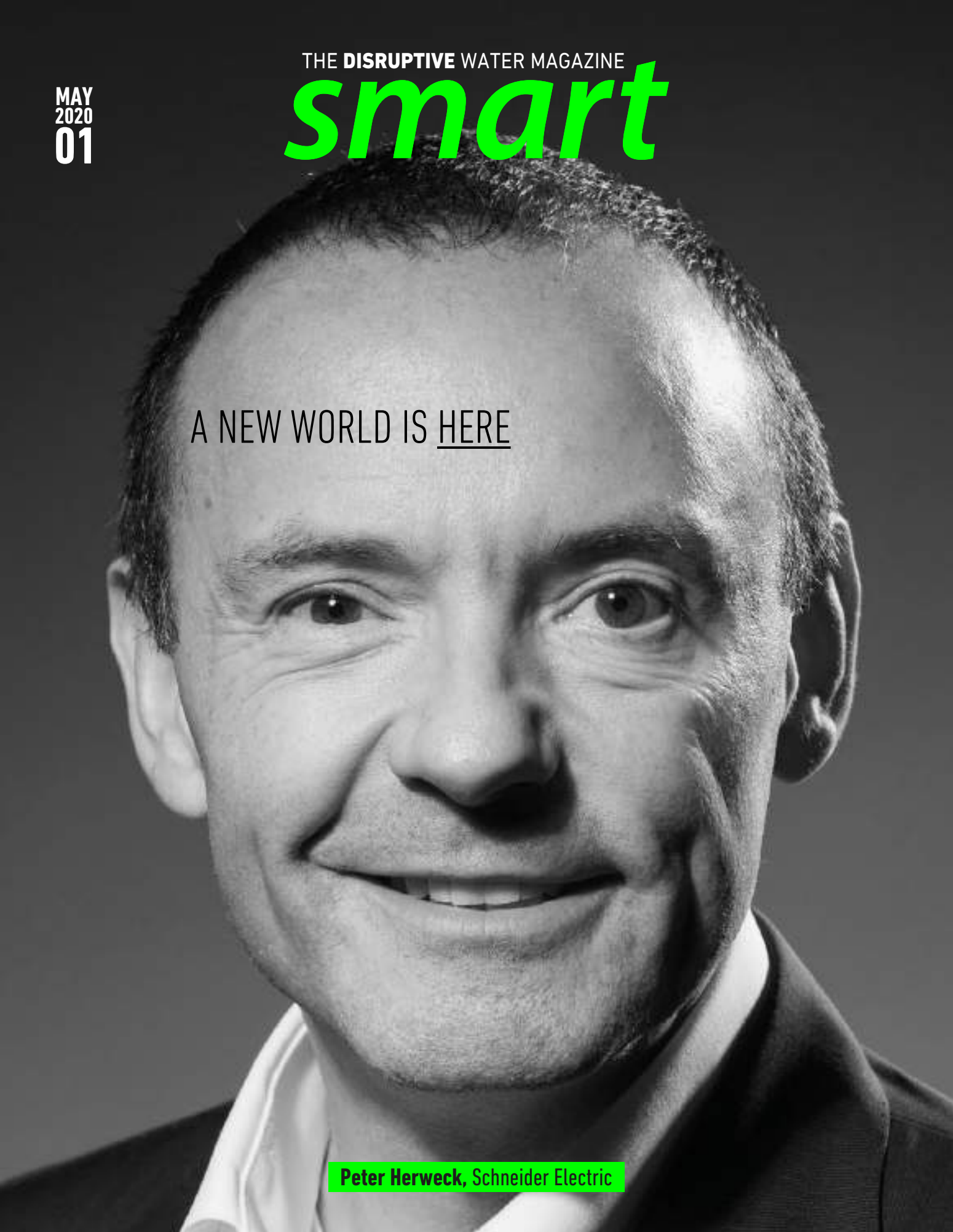
THE **DISRUPTIVE** WATER MAGAZINE

smart



A NEW WORLD IS HERE

Peter Herweck, Schneider Electric

Who is behind the water we use at home?

Jaime and Pablo doing cleaning and disinfection tasks

Pedro and M

Teresa monitoring the quality of water

There are people like Pablo, Juan, Teresa, Pedro... Aqualia's workers who, now that we have to stay at home, continue to work so that every time you turn on a tap you have quality water in your home.

For all this, and much more, we do not rest, even now. This is our way of taking care of you.

People who work for people

aqualia

Your water company

FROM THE EDITOR

IT'S TIME TO TAKE A STEP FURTHER

More than a year ago, Smart Water Magazine was launched with the aim of becoming the leading source of information for professionals in the water industry. In these 16 months, the project has consolidated with excellent results in terms of the traffic received, subscriptions to our newsletters, the growth of profiles on social networks and, above all, the quality of the content generated.

After successfully completing this first launch phase, it is time to move on to the second stage. At this time, the influence gained and the close relationships woven with the most important actors in the world scene allow us to face with confidence the publication of a monthly magazine that completes our information products.

Structured into six core themes: Business, Water Treatment, Digital, Utilities, Climate Change and Sustainable Development Goals, Smart Water Magazine Monthly (SWMM) is born with the aim of analysing in detail the most relevant events that shape the future of water. And, could it be otherwise, this first number is marked by the response to COVID-19. Service managers have been forced to adapt in record time to an event that has tested the resilience of their systems. Protecting the health of workers, guaranteeing water security and articulating formulas to help the most vulnerable have been shared priorities in most countries affected by the pandemic. It can be said that this first test is being passed with flying colours, allowing hundreds of millions of people to continue enjoying clean and safe water.

Nevertheless, this has only just begun. The path to the "new normal" is going to be a long one and our industry is going to change. By reading SWMM you will be able to discover important indications of the road map for the future. The importance of concepts such as health, research, digitization, efficiency or cybersecurity are going to escalate to a new dimension. What we still do not know is what will be the economic and fiscal policy that governments will implement to recover growth and employment after the enormous damage suffered. Expansive strategies that promote public investment are demanded from different areas, which could greatly favour water and sanitation projects. But the shadow of an unprecedented increase in public debt and its possible consequences make it necessary to be cautious concerning these types of solutions to the crisis. In any case, having the best information will be key to finding opportunities and making good decisions in this new and changing situation. We will be here to provide it to you. Welcome.

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smart water magazine

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BARMATEC

Aeration system specialists

INCREASED BIOLOGICAL TREATMENT CAPACITY

ENGINEERING CALCULATIONS OF THE PROCESS

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Hybrid process of active sludge and fixed biomass, being able to benefit from both.

ADVANTAGES

- Low installation cost, it can be installed in a reactor without modifying the aeration system, and even without having to stop it.
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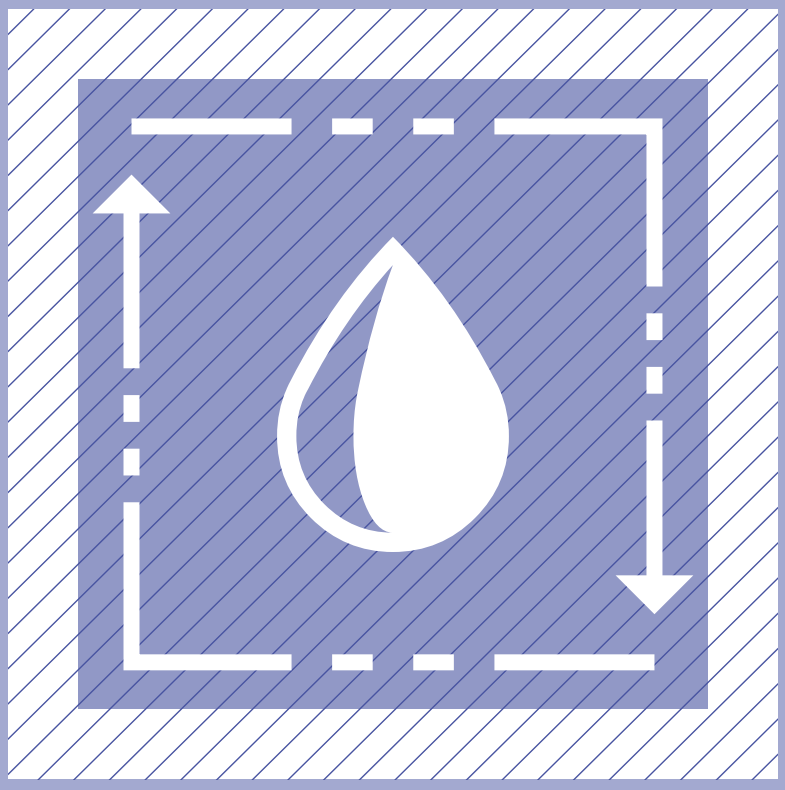


WATER TREATMENT

DAVID BARQUET

"BARMATEC's philosophy is to provide our clients the best solutions for aeration systems"

GENERAL MANAGER OF BARMATEC

Detailed engineering and taking care of all the processes that are part of water treatment are key to ensure the optimum performance of facilities. BARMACTEC's work contributes to that.

Laura F. Zarza - Pablo González-Cebrián

Founded in 2009, BARMATEC is a Spanish company that carries out its activities in the water industry. It has become a leading company in the design and supply of aeration equipment for wastewater treatment plants and other industrial processes in Spain.

In this interview, David Barquet, the General Manager of the firm, tells us about the thorough work BARMATEC is known for.

How would you define BARMATEC?

BARMATEC can be defined as a company that provides global solutions for aeration systems. We offer our clients the design, engineering, and manufacturing of the system, on-site installation and putting it into service.

As a company specialised in aeration systems, we first advise our clients on engineering aspects, carrying out aeration calculations to determine the best type, the number and the distribution of diffusers to ensure the optimum performance of facilities. Afterwards, we do aeration calculations to plan the size of piping for the grid and, based on the type of water and its characteristics, we determine the best material: for example, PVC, PP or stainless steel.

Next, we draw the plans of the facility and we proceed with the manufacturing in our premises, always done by our own staff. Finally, the aeration system is set up on site by our team of specialised technicians.

What values are the basis of your company's philosophy in your field of work?

BARMATEC's philosophy is to provide our clients the best solutions for aeration systems, based on some deeply entrenched values:

★Trust: clients usually choose BARMATEC either because of the confidence that stems from earlier projects or because of the company's reputation based on multiple project references. When clients come to us, it is because they trust our work; they trust that the solution we offer them will be the best and most efficient for their facility. Our products are not commodities; they are custom-designed and custom-made systems, according to specifications that are based on the type of water to treat, taking into account that all waters are different. Hence our clients' trust is very important.

★Advisory services: at BARMATEC we always advise our clients on what we think is the best option. Although sometimes projects are already defined in terms of the number of diffusers or their distribution, we always go one step fur-

ther: we provide technical advice regarding their aeration project, outlining any concerns or potential mistakes we may find in their design, so the customers have more information before they make a decision.

★ Professionalism: we take our work very seriously and when someone seeks our services, our specialised technicians study the case together with the Technical Management, and simultaneously we double check with our manufacturer of diffusers in Germany. This enables us to have three technical validations, certifying the correct design of the facility. Once the client approves the project, we proceed with the construction plan in our engineering department, and it is afterwards manufactured in our premises by our own staff. In addition, we have our own technicians in charge of the set-up, which ensures the installation is done properly. Thanks to these working procedures we can have total control of the entire process, preventing any potential errors.

Reliability of delivery dates: our entire team at the company is well aware that we work in an essential sector and that it implies certain responsibilities. Therefore, when we agree on a delivery date with a client, we meet the deadline.

Client service: for BARMATEC, the real client service starts when there is an urgent matter or an incident. It is in these cases when the client expects most from the company they have trusted, and it is in these situations when the experience of a company like BARMATEC ensures a quick response to the incident and the solution to the problem, standing out from its competitors.

"Clients turn to BARMATEC either because of the confidence that stems from earlier projects or because of the company's reputation"

"Our products are custom-designed and custom-made systems, according to specifications that are based on the type of water to treat"

BARMATEC specialises only in aeration systems, something which, no doubt, is unique about your company. What advantages does this have in the market in terms of competitors?

Because we design, manufacture, and install our own aeration systems we can enhance each project, adding improvements in each facility, in such a way that our projects are continuously getting better and better.

Our expertise enables us to advise the client in the selection of the best process design, of the type of diffuser needed, or the type of membrane which is most appropriate for their water, or else the most suitable type of grid system (fixed or retrievable) given future maintenance.

For example, many companies do not pay attention to the optimal location of components as basic as condensation purge systems in the aeration grid, or they may even do away with them. Likewise, a basic concept such as calculating the diameter of the piping for the aeration grid, taking into account head loss and seeking a homogeneous air distribution, is something some manufacturers disregard.

What is the weight of engineering as a distinct value offered by BARMATEC as a leading provider of aeration systems for water treatment?

The hallmark of BARMATEC's aeration grids is their engineering design. In this regard, whereas many grid manufacturers use standard design patterns, often based on the limitations of their diffusers and accessories, BARMATEC designs each grid according to process needs, overcoming the limitations and restrictions of some of the leading companies in the sector.

BARMATEC has grown and forged a place for itself in the aeration world undertaking non-conventional projects

that others failed at or would sidestep because of their technical difficulty. BARMATEC's aeration grids have constantly progressed based on experience and innovation.

The detailed engineering work done by BARMATEC is essential to ensure the effectiveness and efficiency of a facility, enabling affordable maintenance in the future and maximising the service life of equipment. Furthermore, part of the engineering work focuses on the manufacturing, optimising the materials and the manufacturing means used for the equipment, the quality, and compliance with the demanding delivery deadlines in the sector.

One of the products BARMATEC is well known for are retrievable diffuser systems. What are their main features?
BARMATEC's aeration grids are special and unique because they are all custom made. Currently, it is difficult to find a company that designs and manufactures aeration grids like those made by BARMATEC in the market.

For many years, when a biological reactor was built with an aeration system based on diffusers, fixed grids were used, without taking into account that to repair or replace the diffusers or their membranes, the biological reactor had to be stopped and emptied, sometimes for weeks at a time. As time went by, these difficulties and stricter environmental regulations have led for the need to do maintenance operations with no stops, and the evolution from a fixed grid with low added value in terms of engineering, to a retrievable grid, highly complex in terms of the design and installation.

The design of the grid takes into account a series of variables such as: the oxygen needs to degrade the organic load and remove nitrogen; the geometry of the reactor; the maintenance needed to determine the type of grid (fixed/retrievable); the selection of manufacturing materials to ensure durability; the set-up of constraints (with the tank empty or full) and the operation constraints (minimisation of head loss, limitation of flow per diffuser, optimisation of air diffusion, energy efficiency improvements, etc.).

A paradigmatic aspect of BARMATEC's designs is that the dimensions of the biological reactor or the impos-

"BARMATEC designs each grid according to process needs, overcoming the limitations and restrictions of other companies"

BARMATEC has forged a place for itself in the aeration world undertaking non-conventional projects that others failed at

sibility of emptying it are no longer critical limitations, just one more factor for the design. In terms of the reactor's dimensions, BARMATEC has made retrievable grids that measure more than 20 metres in length, combining a comprehensive design and structural calculations for the benches with ease of transportation and on site set up. Regarding the impossibility of emptying the reactor, BARMATEC has designed and set up aeration grids in tanks in operation without stopping them, using grids that are supported or suspended, even on the old diffusers.

Currently the supporting structures or benches for our retrievable grids are wholly made of stainless steel with different levels of protection, suitable for each type of water, thus avoiding corrosion or degradation issues, with nearly life-long durability.

All of our retrievable grids are previously designed so they will not float during set up nor while in operation; moreover, they feature a system to ensure they are easily removed and placed back.

A detailed study of each and every need and taking these into account during our manufacturing process is the main characteristic of our retrievable grids that makes them well known.

Can you please tell us about some successful cases where BARMATEC's aeration grids have been used?

BARMATEC was founded in 2009. Since then, we have been involved in countless projects, so it is difficult to recall them all. Several recent facilities are, although, worth mentioning due to their performance and complexity.

One of them involved the installation of retrievable grids in an ice-cream factory. The singularity of that project was that the client was initially reticent to installing an aeration system using diffusers, as they had one in the past which had performed poorly with problems associated. Those diffusers were replaced by a Venturi-type forced aeration system with a blower, which resulted in increased power consumption, low performing air diffusion and alterations to the structure of the biological sludge. Thanks to the company that operates the water treatment plant, and after presenting a study explaining why the earlier diffuser system had failed, they decided to install our retrievable grids of tubular diffusers. The biological performance was spectacular both in terms of the process and operations. The oxygen dissolved in the pond increased drastically, something which had never been achieved with the aeration system, and the use of the blower from the old air injection system was minimised, eliminating the pump used to recirculate the sludge in the Venturi system. This improvement has left behind problems in the plant regarding the variations in the input load and its effect on the reactor's oxygenation, and enabled increasing the working concentration (MLSS) and the treatment capacity.

Another important project, at the end of last year, involved the manufacture, supply and set up of a total of eight retrievable grids in a waste water treatment plant in the province of Lleida, in order to eliminate old rotors. The uniqueness of this facility is that the grid set-up was achieved without stopping and emptying the two plant reactors, while maintaining the quality of the effluent all the time.

A large portion of the activity of BARMATEC is national. What is the company's presence in the international market?

90% of our sales are concentrated in the Spanish market, and we started to expand into other countries a couple of years ago. We have worked on several projects in Portugal through our Portuguese subsidiary company TecnoConverting Portugal; we are also involved in several projects in France and are currently also working in the Asian market, with projects in Shanghai and Taipei, via our office in Shanghai.

We also work in Latin America, with more than fifteen projects completed in Ecuador and Costa Rica.

Finally, let us look at the future. What is the company's strategy for the coming years?

Our mission is to become established as one of the leading companies in

aeration systems internationally, the same as we have done in Spain. To achieve this, we have invested heavily in R&D, incorporating new products such as the BTEC Biocarriers, which, adding between 12 and 15% to the volume of the reactor, can double the performance of the reactor, reducing the presence of bulking processes, and stabilising nitrification and denitrification, among other advantages. We have also incorporated Strip-Diffusers with ultra-fine bubbles, which have a larger surface than conventional diffusers, are easier to install and increase the performance 20% over that of conventional diffusers, with almost no cost to replace membranes, and with savings in monthly electric power use of more than 12%.

90% of our sales are concentrated in the Spanish market, and we started to expand into other countries a couple of years ago

OPINION

ERIC BINDLER

RESEARCH DIRECTOR, BLUEFIELD RESEARCH

COVID-19: WATERSHED MOMENT FOR DIGITAL TRANSFORMATION OF WATER SECTOR

It is difficult to overstate the challenges that COVID-19 poses for the water sector, from operational difficulties to acute financial shocks. But the pandemic also presents a long-term opportunity for the industry to rethink the status quo and embrace innovation. In particular, we see the crisis as a proving ground for digital water technologies, and a potential watershed moment for the digital transformation of the water sector.

Utilities that have already made digital investments are best positioned to cope with crisis

It is still early days, but the stories we've heard across the industry suggest that digital technologies have already played an invaluable role in helping utility workers remain connected to their critical assets, customers, and co-workers amid widespread lockdowns. In many cases, utilities which made robust investments before the crisis in digital monitoring and control capabilities – e.g. automation and optimization platforms, sensor and telemetry equipment, remote workforce and customer management tools – are faring better than those that did not.

Meanwhile, technologies that can be deployed rapidly to fill existing operational gaps have seen a boost in demand. According to a recent American Water Works Association survey, 74% of U.S. & Canadian utilities have implemented telework policies for non-field employees in response to the pandemic. Some utilities have asked as many as four-fifths of their staff to stay at home, necessitating significant investment in remote communication and productivity (e.g. laptops, teleconferencing platforms), online billing, and cybersecurity.

Digital water will top the agenda for post-pandemic resilience planning

While the COVID-19 crisis is unique in many respects, it is neither the first nor the last social, economic, or environmental disruption that the water industry will face in the coming years. Thus, when the pandemic subsides and utilities' focus returns to long-term resilience planning, digital tools are likely to be top of mind. Platforms for remote monitoring, management, and control of critical infrastructure will be in high demand. Revenue recovery and cost optimization solutions such as smart metering, leak detection, and advanced asset management will also receive greater attention as utilities seek to shore up strained financial positions. Cybersecurity will remain paramount as increasing device density creates more potential attack surfaces.

More broadly, the sudden shift to remote, distributed work has forced utilities to rely on digital tools to an unprecedented degree. Assuming no major lapses in performance or cybersecurity, utility leaders will likely emerge from the COVID-19 pandemic with greater familiarity and trust of digital technology in general, dispelling some of the industry's cultural barriers to digital innovation, and driving more rapid adoption of digital water solutions moving forward.

Utility leaders will likely emerge from the COVID-19 pandemic with greater familiarity and trust of digital technology in general

Out of crisis and disruption, come innovation and growth

COVID-19 has brought considerable hardship to the water sector. However, this period of disruption will also lead to significant innovation, as utilities adapt to fundamentally new ways of doing business. Many of today's leading digital platforms – like Uber, Slack, and WhatsApp – were founded during the Great Recession. Similarly, there were more digital water companies founded globally in 2009 than any year prior, many of which have gone on to become market leaders.

At Bluefield, we have updated our forecasts to account for the impact of COVID-19. Though we expect a near-term contraction in the digital water market due to project delays and recessionary conditions, we ultimately believe this crisis will advance the digital water market by at least 2-3 years by the latter half of the decade, with a total of about US$9 billion in additional, cumulative market value generated in the U.S. & Canada alone by 2030.

ROBERT C. BREARS

EDITOR IN CHIEF: CLIMATE RESILIENT SOCIETIES & AUTHOR

THE CIRCULAR WATER ECONOMY IS THRIVING

A variety of locations are implementing circular economy concepts that promote the reduction of water consumption, reuse of water, and recovery of materials from wastewater.

The linear economy

Our current economic model can be best described as 'linear' which typically involves economic actors (people or organisations) harvesting and extracting natural resources, using them to manufacture a product, and selling a product to other economic actors, who then discard it when it no longer serves its purpose.

In the linear economy, following this 'Take-Make-Dispose' model, the water sector typically employs the 'Take-Use-Discharge' strategy. In this strategy, water is 'withdrawn' from streams, rivers, lakes, reservoirs, oceans, and groundwater reservoirs as well as harvested directly as rainwater. Water is then 'used' by municipalities, industries, agriculture, the environment, etc. within the water cycle, including for consumptive and non-consumptive uses. Non-consumptive used water is 'returned' to the river basin directly or via a municipal treatment facility. Depending on the location within the basin this returned water could then be used downstream or lost to the basin.

Governments around the world are implementing a variety of policies to encourage the transition towards the 'circular economy'

The circular water economy

While the current linear economic model has generated an unprecedented level of growth, the model has led to constraints on the availability of natural resources in addition to the generation of waste and environmental degradation. In response to climate change, increasing resource scarcity, and environmental degradation, governments around the world are implementing a variety of policies to encourage the transition towards the 'circular economy' that focuses on reducing material consumption, reusing materials, and recovering materials from waste.

In the context of water resources management, water utilities are beginning to promote the circular water economy that reduces water consumption, reuses and recycles water and wastewater, and recovers materials, including heat and minerals, from water and wastewater to not only mitigate greenhouse gas emissions but also enhance resilience to climate change.

Reducing Water Usage with Smart Meters in Singapore

To meet future demand for water with today's technologies, Singapore's Public Utilities Board's (PUB) energy footprint will need to quadruple from the current 1,000GWh/year to 4,000GWh/year. To reduce this demand, PUB trialled a smart water network that collects detailed data on household water consumption to build customer consumption profiles and identify consumption patterns and trends. The trial enabled customers to set water-saving goals and track their performance. This trial is part of the utility's wider scheme of installing 300,000 smart meters in new and existing residential, commercial, and industrial premises by 2023.

Reusing Water in New York City

New York City's Department of Environmental Protection has launched its On-Site Water Reuse Grant Pilot Program to provide commercial, mixed-use, and multi-family residential property owners with incentives to install water reuse systems. Grants are available for water reuse systems at the individual building and district level, with district-scale projects involving two or more parcels of land such as a housing development, where the project reduces demand in the shared distribution system.

Recovering Biogas in Stockholm

In Stockholm, the two sewage treatment plants, Henriksdal and Bromma, produce around a million tons of sludge per year. When the sludge is digested biogas is formed, providing a steady stream of vehicle fuel: currently, around 17 million cubic meters of crude gas is produced which is sold to Scandinavian Biogas, who then transform the raw gas into vehicle gas. The gas that is not converted to vehicle gas is used for heating and electricity generation.

In conclusion, a range of innovative technologies is available to close the loop and create a circular water economy.

DR JOHN CHERRY

- DIRECTOR, THE UNIVERSITY CONSORTIUM.
- ADJUNCT PROFESSOR, UNIVERSITY OF GUELPH.
- DISTINGUISHED PROFESSOR EMERITUS, UNIVERSITY OF WATERLOO.

"We need more curiosity about water in the educational system"

Since 1991, SIWI in cooperation with the Royal Swedish Academy of Sciences present the annual Stockholm Water Prize, the world's most prestigious water award. Usually announced to coincide with the World Water Day, the Prize recognizes organizations, women and men from around the globe for exceptional water-related achievements.

Olivia Tempest

This year, Dr John Cherry, a Distinguished Professor Emeritus from the University of Waterloo in Ontario, Canada, and a world-renowned expert on the threats to groundwater from contamination, was named the 2020 Stockholm Water Prize Laureate. A geological engineer by training, Dr Cherry has transformed the scientific paradigms of groundwater research through the creation of the academic field contaminant hydrogeology.

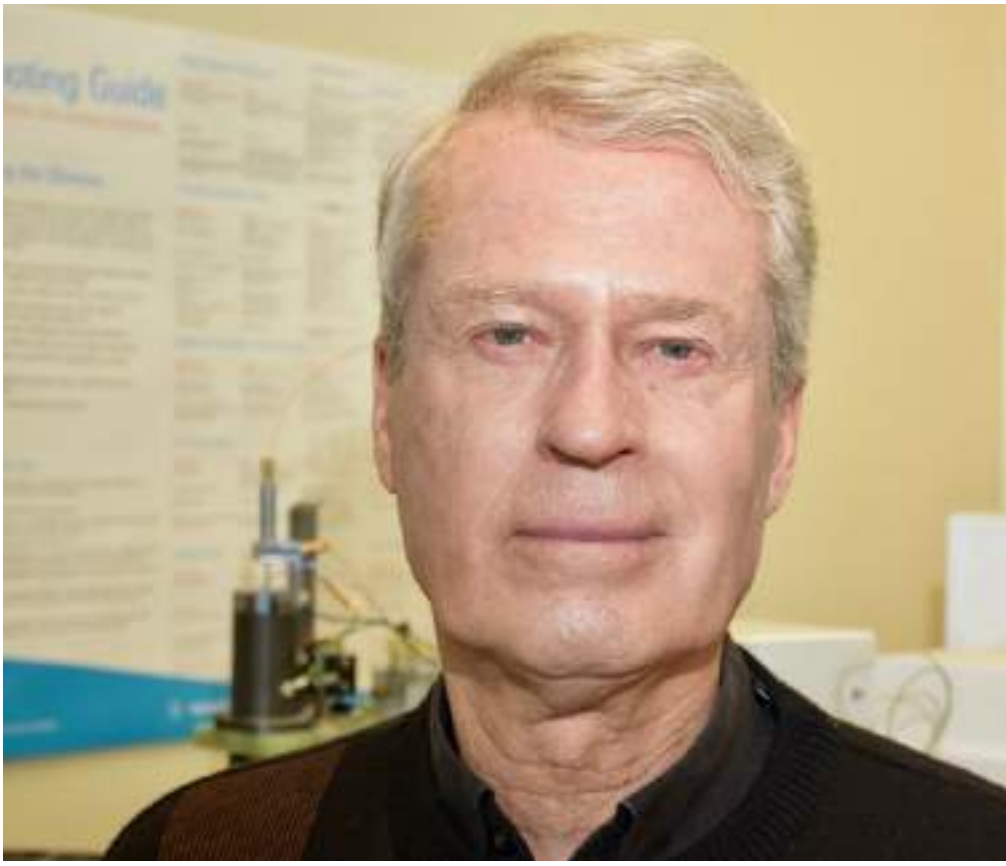
Numerous countries such as Brazil, Canada and the United States have implemented Dr Cherry's approaches to groundwater monitoring. Presently working on various projects and research, providing groundwater knowledge to students and water professionals around the world is particularly important to him. This is why he and other leading groundwater scientists are launching the Groundwater Project in August 2020, making their texts available free of charge for anyone to use.

We have had the pleasure to speak with him on what it means for him to receive the Stockholm Water Prize, and what can be done to make groundwater, a fundamental source of drinking water, that is too often out-of-sight and out of mind, a priority.

What does it mean for you to receive the Stockholm Water Prize?

I am very pleased to receive this prize because it draws attention to groundwater and provides me with higher profile opportunities to talk about the state of the groundwater environment and current projects that I believe are important concerning the water global environment. Groundwater makes up 99 percent of all liquid freshwater and provides nearly 50 percent of the global population with drinking water while contributing to about half of global food production. Groundwater seepage makes up about half of all river flow and sustains our wetlands. Groundwater is important in many countries, but it is out-of-sight and generally out of mind. I am the second groundwater scientist and the second Canadian to receive this Prize; the first Canadian in years. Over these 30

years in Canada, federal and provincial governments have allowed water monitoring, management and overall water care to decline to shameful levels on international standards. I hope that I can use the credibility that comes with this prize to draw attention in Canada to this situation. I am a groundwater contamination expert and I have built my career on doing collaborative field-focused research at contaminated sites. This type of research is expensive, and, over the past 50 years, I have been well supported by government and industry to do this research. We know a lot about groundwater contamination and how to monitor it, but in general across the globe little of this knowledge is being put to adequate use to serve societal needs in the assessment and protection of groundwater resources. This Prize will help to draw attention to this knowledge and experience.



As recipient of the Stockholm Water Prize, how do you think this will shed a light on groundwater protection and management?

As recipient of this Prize I feel that it is my responsibility to draw attention in whatever ways I can to the dismal state of groundwater protection and management in nearly all countries. Groundwater contamination is widely ignored for various reasons, perhaps the most important being that we do not see or sense the state of the groundwater environment and the degradation of groundwater quality is a slow process; connections between cause and effects are not readily apparent because we monitor so sparsely.

"It is my responsibility to draw attention in whatever ways I can to the dismal state of groundwater protection and management"

As a society we can see the effects of air pollution and climate, but rarely can we sense that the quality of the groundwater environment is on a long-term decline. There is fresh groundwater beneath us everywhere. The top of the groundwater zone is just a few meters or tens of meters below the land surface nearly everywhere that people live. We pay so little attention to it. This groundwater is flowing slowly from one area to some other area and this flow is important in many ways. With the attention from this Prize, it is my responsibility to draw attention to groundwater and to make the groundwater story interesting and the importance of groundwater evident. This is not easy, but I have excellent colleagues across the globe helping me with this.

You recently said: "Though the global water crisis is starting to get more attention, groundwater is often forgotten, despite it making up 99% of the planet's liquid freshwater." What do you think can be done to make it more visible?

To make groundwater more visible, we need to get people to ask more questions about water and groundwater in particular. For example, when we drink water, we should ponder: what is in the water or what is the chemical composition of the water; why does the water taste as it does; when we turn on the tap, where does the water come from; when we flush the toilet, where does the water go and where does it end up? When we eat a meal, how was water essential to the production of the food? Given that the human body is made up of 99.9 percent water molecules based on percent molecules (75 percent by weight) and that groundwater makes up 99 percent of all liquid freshwater, we should know more about how we hu-

To make groundwater more visible, we need to get people to ask more questions about water and groundwater in particular

mans connect to water in general and groundwater in particular. We need more curiosity about water in the educational system. In the simplest sense, water is just H_2O but in fact water is a wonderful and marvelous substance that we trivialize by the H_2O notation. We need ponder much more than this basic chemical formula. So, given these basic water questions that have so much to do with human evolution, survival and enjoyment of living on our Planet, it needs to become more evident that seeking of answers to these questions is part of being a conscious global citizen. There needs to be democratization of water knowledge with groundwater included as a key component of the freshwater cycle. The problem starts at university level education where water knowledge is fragmented into siloes that impede the overall understanding and focus on what is important. Universities have become more part of the problem rather than part of the solution.

What are the most threatening contaminants currently found in groundwater resources?

In the 1950's, chromium, petroleum products and detergents were found in groundwater. They did little harm because they are readily "assimilated" by retention in the geologic media or biodegradation in the vast groundwater reservoir. Assumed assimilative capacity was the basis for septic systems to become ubiquitous in the countryside. The first inkling that not all groundwater contaminants are readily assimilated came from promulgation of the US 1974 safe drinking water regulations, which resulted in chlorinated solvents being found in thousands of public water supply wells across the United States. More regulations in the United States in 1980 and later elsewhere mandated investigations of contaminated industrial sites, which revealed widespread chlorinated solvents (e.g. PCE, TCE, TCA and daughter products). This showed that some toxic chemicals are not readily degraded and travel long distances in some aquifers. More types of mobile and persistent industrial chemicals have been discovered since the 1990's in water supply wells, including 1,4 dioxane, pesticides, perchlorate and pharmaceuticals. The most recent discovery is per- and polyfluoro-

"There needs to be democratization of water knowledge with groundwater included as a key component of the freshwater cycle"

The problem starts at university where water knowledge is fragmented into siloes that impede the overall understanding on what is important

alkyl substances known as PFAS comprising thousands of compounds. PFAS may be the worst of all because they resist gradation, they have large toxicological and analytical challenges and the drinking water standards are set externally low (picograms/L). Each new contaminant type found in groundwater has appeared as a surprise, shameful testimony to society's lack of foresight.

The one chemical that has not been a surprise is widespread nitrate and phosphorus from agriculture. Much of the nitrogen and phosphorus applied to crops is flushed into groundwater. Nitrate is mobile and migrates in groundwater to impact the ecosystems of rivers, lakes and estuaries. Phosphorus travels more slowly so the impacts are delayed but inevitable. Because there are now

many types of contaminants that are mobile and degrade slowly or minimally and because chemical residence times in groundwater are decades to centuries, groundwater contamination should be viewed as cumulative rather than just passing through. Polluted groundwater rarely has a bad taste or smell, which gives an unfounded but intuitive confidence in groundwater 'purity', however water wells showing no anthropogenic chemicals are rare. People commonly ask whether or not the water provided by wells is safe to drink. The answer to this question used to be based on a few routine and simple tests, but now in many areas to answer the question based on what science has to offer requires a diverse array of sophisticated tests to determine the chemical concentrations to the micrograms per litre level or below because people increasingly want to know what is in the water they drink. Many do not believe their public drinking water is safe and so resort to bottled water for which requirements for analyses are less than for public drinking water.

The G360 Institute for Groundwater research has developed many independent technology patents. What work is the G360 currently working on?

The G360 Institute, where I am a senior advisor and participant in a few projects, is one of the most active academic units in the world focused on field studies of groundwater contamination. This team led by Dr. Beth Parker has many different projects, amongst them is continual development and testing of new ways to acquire information from groundwater systems relevant to many hydrogeologic environments around the globe with projects in Canada, USA, Sweden, China, Brazil, and beyond. G360 is a very collaborative organization. For example, G360 has a nearly two-decade long collaboration with the City of Guelph (population 130,000) near Toronto to

"Each new contaminant type found in groundwater has appeared as a surprise, shameful testimony to society's lack of foresight"

> **Polluted groundwater rarely has a bad taste or smell, which gives an unfounded but intuitive confidence in groundwater 'purity'**

design and install a high-resolution 3D groundwater monitoring network using the most advanced technologies to track groundwater levels and water chemistry over time. In conventional groundwater monitoring networks, each borehole has only one or two monitor wells installed but modern technologies allow each hole to have data acquisition form many different depth intervals in each hole, with ports placed to avoid cross-connection, so that the groundwater system is observed in its full three dimensional complexity. Guelph gets nearly all its water supply from the bedrock aquifer beneath the city and now serves as an example of world class urban groundwater monitoring. As better methods are developed, they are applied here immediately to assess their effectiveness and to provide 'ground truthing' of a sophisticated computer model to represent the interconnected groundwater and surface water system. Another project example involves development of methods to create small diameter, safe water supply wells at locations where access by conventional water well drilling machines is not possible. This project makes use of small portable drills used in the mineral exploration industry to drill just about anywhere at relatively low cost. The aim is to demonstrate innovative ways to make safe, low-cost wells in developing countries and in remote aboriginal communities. More than a billion poor people around the globe need safe drinking water wells, which is a problem that is not being solved using the conventional ways to making water wells.

Could you tell us a bit more about the Groundwater Project?

Depletion of the quantity of global groundwater and degradation of its quality has been occurring silently over decades with minimal societal awareness of the unfolding crisis. This results from a generally poor understanding of the specialized physics and chemistry and commonly ineffective governance structures established long ago without knowledge of groundwater science. Typically, this results in inadequate or nonexistent groundwater monitoring and modeling of what is going to happen with ballooning population and expanding industrialization. The first step towards reversing the trends must be education about all aspects of groundwater to serve the full spectrum of stakeholders. To date, groundwater science has not served humanity to its full potential in part because we have not spoken well to a broad multidisciplinary readership (e.g., water supply for society and ecosystems, mining, agriculture, industry, management). In an attempt to overcome these shortcomings many colleagues across the globe and I have initiated the Groundwater Project that incorporates the voluntary expertise of scientists and engineers from 24 countries on 6 continents who are preparing hundreds of educational "book type" chapters for free online distribution wherever there is the internet. Our goal is to explain 'nearly all things groundwater,' at introductory, university and advanced levels of treatment relevant to both developed and developing countries. Our website (gw-project.org) began operations on March 23, a day after World Water Day, 2020 and the first set of mini-books will be published on the web site in August with hundreds more to appear there over the next few years. We have plans for rapid crowd-sourced translations to follow each of the initial publications in English. The spirit of volunteerism across the globe that supports this effort is much beyond what I had thought possible. I am leading this effort to get it off the ground, but it is truly a collaborative global project and I am being swept along in its current.

You have often urged governments to devote more of their budget to groundwater monitoring. With rapid population growth and increasing impacts of climate change, what do you think can be done to encourage worldwide governments to devote more of their budget to groundwater monitoring?

The United Nations recognized safe drinking water as a human right in 2010, yet access to this right is diminishing. Bold initiatives by government are needed such as: water taxes to fund

transparent monitoring and research to understand the full nature and scope of contamination; agricultural policies to level the playing field for chemical versus ecological agriculture; laws that require all drinking water sources to have routine precautionary chemical and pathogen analyses; laws for all new chemicals and products to have full-cycle assessments of toxicology and fate in groundwater; incentives for the pursuit of 'cradle to cradle' manufacturing; and democratization of groundwater education for all stakeholders. But to prompt such initiatives there needs to be awareness of the known magnitudes of the problems and the projections and uncertainties surrounding the issue. I hope that we can use The Groundwater Project to make government and water management circles more aware of the problems and the implications of climate change and population and industrialization expansion. Specifically, it is my intention that in The Groundwater Project, we seek out the best examples from around the world concerning groundwater monitoring, management, protection and governance. There are examples worth emulating in many countries around the globe, however the problem is that they are buried in the technical literature or hidden from view in the bureaucracies. These examples where governance is modern and responsible are critical to understanding what needs to change and why criticism is warranted in some areas. Irresponsibility concerning groundwater is common across the globe but there are bright spots where credit needs to be given. The Groundwater Project is about democratization of knowledge and is aimed at groundwater education. This includes identification of what is happening around the globe that is positive and worthy of attention with the goal of moving groundwater towards a sustainable resource.

"The G360 Institute is one of the most active academic units in the world focused on field studies of groundwater contamination"

SOME WASTEWATER REUSE PROCESSES CAN LEAD TO UNDESIRED BYPRODUCTS

Potable water reuse is a boon for sustainability, but USC researchers warn of potentially toxic byproducts

In World War I, German forces used concentrated chloropicrin, a harmful chemical compound, to deter soldiers by creating irritation and illness. In modern times, chloropicrin is used as a pesticide. It could also be a potential byproduct of certain processes used to treat wastewater.

Researchers from University of Southern California (USC) Viterbi, including Assistant Professor in the Sonny Astani Department of Civil Engineering Daniel McCurry and Ph.D. student Jiaming Lily Shi, found that a particular wastewater treatment process, ozonation, could convert chemicals present in the water to chloropicrin.

Among their key findings, published in Environmental Science and Technology, was that wastewater reuse treatment processes that use ozonation to disinfect drinking water create nitromethane. Dangerous enough on its own, when nitromethane interacts with chlorine, which is required in making treated wastewater potable, it can result in the formation of the highly toxic compound chloropicrin.

The results are predicated on the idea that nitromethane persists in the wastewater treatment process, which is likely, as no part of the current water reuse processes is currently focused on breaking it down. Highly toxic, chloropicrin is currently unregulated, but has been studied as a disinfection byproduct in drinking water since the 80s with little progress in identifying its precursors and formation mechanism until now.

McCurry and Shi worked to investigate potential precursors to the formation of nitromethane. As it is unlikely to occur naturally in wastewater, the researchers theorized its formation comes from the addition of ozone. One such category of precursors for its formation, as reported in the study, is stimulant drugs, including certain anti-depressants. While ozone has been proven to be effective in removing many pharmaceutical compounds from wastewater, it has been recently shown in certain circumstances to increase the toxicity of the final wastewater effluent — or the post-treatment water. Further concern results from the addition of chlorine, which is added during final steps of treatment to make wastewater drinkable.

McCurry and Shi are evaluating whether nitromethane does indeed persist in reuse treatment processes. If ozone is often the first step during water reuse treatment processes, would subsequent treatment steps get rid of the nitromethane formed upon its infusion? Initial results suggest that traditional treatment systems, which use reverse-osmosis and an advanced oxidation process do little to remove or destroy nitromethane. However, an alternate treatment method, one that uses ozone followed by biologically-active carbon, seems to do a good job of clearing nitromethane.

Ultimately, as ozonation has become more common and water shortages continue expanding the need for more sustainable water practices, such as water reuse, it's imperative chemical byproducts of treatment processes are more carefully studied, McCurry said.

TRANSFORMING WASTEWATER BY-PRODUCTS INTO SUSTAINABLE GREEN FUELS

A team of EU-funded scientists has developed and tested a new technology to convert sewage sludge into bio-oil

A huge quantity of organic waste from various sectors either ends up in landfills or gets incinerated, further increasing greenhouse gas emissions and soil and water pollution. To address this issue, it's crucial to develop and implement a proper waste management plan.

The EU-funded TO-SYN-FUEL project is making great strides in transforming several types of biomass residues into CO_2-neutral liquid fuel. "For the conversion of biogenic residues to sustainable advanced biofuels, Fraunhofer UMSICHT developed and realised a new technology, named Thermo-Catalytic Reforming (TCR®)," as noted in a news release on the project website.

"Starting from tests on a lab-scale unit to the fuel production demonstrated on a pilot scale, the TCR® technology was then scaled-up to a 300 kg per hour plant for the conversion of sewage sludge at an industrial rate," the same news release adds. It also states: "The ongoing step of a technical demonstrator development is part of TO-SYN-FUEL. The operational capacity is designed for 500 kg per hour of dried sewage sludge. The development process of this novel technology has shown a high potential in the utilization of biomass and residues." Dr -Ing. Robert Daschner from Fraunhofer Institute for Environmental, Safety, and Energy Technology (UMSICHT) says: "In this project we want to produce advanced biofuels from waste, which in this particular case will be sewage sludge. We are building-up the plant and we will operate and demonstrate the technology in operation." He adds: "By the end of the project we want to have a business case for sustainable green fuels in order to support the targets of the European Commission." The plant will produce over 200 000 l of biocrude oil, according to the news release.

TO-SYN-FUEL involves the development of an integrated process that combines TCR® with hydrogen separation through pressure swing adsorption and hydrodeoxygenation (HDO). The project website explains the process: "The TCR® technology converts a broad range of residual biomass into three main products: H2-rich synthesis gas, biochar and liquid bio-oil, which can be upgraded. By high pressure hydro-deoxygenation HDO and conventional refining processes, a diesel or petrol equivalent is created in the distillation and is ready to be used directly in internal combustion engines."

TO-SYN-FUEL (The Demonstration of Waste Biomass to Synthetic Fuels and Green Hydrogen) will run until end-April 2021. CORDIS states: "This project will mark the first pre-commercial scale deployment of the technology processing up to 2100 tonnes per year of dried sewage sludge into 210,000 litres per year of liquid biofuels and up to 30,000 kg of green hydrogen. The scale up of 100 of such plants installed throughout Europe would be sufficient to convert up to 32 million tonnes per year of organic wastes into sustainable biofuels, contributing towards 35 million tonnes of GHG savings and diversion of organic wastes from landfill."

CHILE AND PERU TURN TO DESALINATION TO ADDRESS INCREASE IN WATER DEMAND

Desalination plants are being built to provide water to the mining sector as well as for domestic use

Peru and Chile are experiencing a growth in water demand for domestic use as well as for mining operations. In addition, Chile is facing the worst drought in 60 years, with water deficit expected to worsen due to climate change. Both countries are considering water desalination as an alternative to increase their water supply, informs BNAmericas.

While access to water is a challenge for mining companies in several countries, those challenges intensify when they compete for ground and surface water with local communities.

Seawater desalination accounted for 20% of water use by mining operations in Chile in October 2019. Twelve major plants are currently providing water to the mining sector, and 15 more are planned. On the other hand, two plants are under way to provide water for domestic uses in Chile. In addition, Latin America's largest solar powered desalination plant is being built in Atacama. Known as ENAPAC (Energy and Water for the Pacific), the US$1 billion project, focused on mining, is undergoing court review.

Meanwhile, Peru's mining industry is also turning to desalination. The Pampa de Pongo iron ore mine under development in Arequipa, worth US$2.2 billion, contemplates a desalination facility with a capacity of 11.6 l/s. Concerning domestic water use, the government of Peru has planned 3 desalination plants for US$240 million, and a fourth one will soon be completed in Lima. The authorities plan to award future desalination projects following a PPP model.

NEW CENTURIUM PRIZE CHALLENGES RESEARCHERS TO RETHINK BRINE

The competition has been launched to further research into environmental practices related to brine discharge

Sandooq Al Watan, an initiative to support research backed by Emirati business people has launched the Centurium Prize Challenge, informs the Emirates News Agency. Known as "Rethink Brine", it aims to decrease the amount of brine discharged into the environment by desalination plants.

The Environment Agency of Abu Dhabi (EAD) sponsors the challenge, together with UAE-based Aldar Properties, with the Emirates Water and Electricity Company as a partner. The objectives are protecting the ecosystem of the Arabian Gulf, encouraging environmentally friendly practices in the construction and real estate sector, addressing water scarcity, and advancing the UAE Water Security Strategy 2036.

The Secretary-General of the EAD, Dr Shaikha Salem Al Dhaheri, has said: "Brine discharge increases the salinity of the surrounding sea water, causing a reduction in oxygen levels that, in turn, impacts marine life. As the environmental regulator of Abu Dhabi, conserving nature and biodiversity is one of our fundamental responsibilities, and addressing brine discharge is one of EAD's top priorities." According to CEO of Aldar Properties Talal Al Dhiyebi, turning the brine discharge into construction material would further Aldar's goals of reducing their impact and support R&D efforts.

A committee of experts will evaluate the entries to the competition. A total of AED3.4 million (over $900,000) will be awarded, and the final winning team will receive $680,000 prize.

BURSTING BUBBLES CLEAR THE WAY FOR DESALINATION

Carbon dioxide bubbles could be a fast and ecological way to unclog seawater filters and keep the supply of drinking water

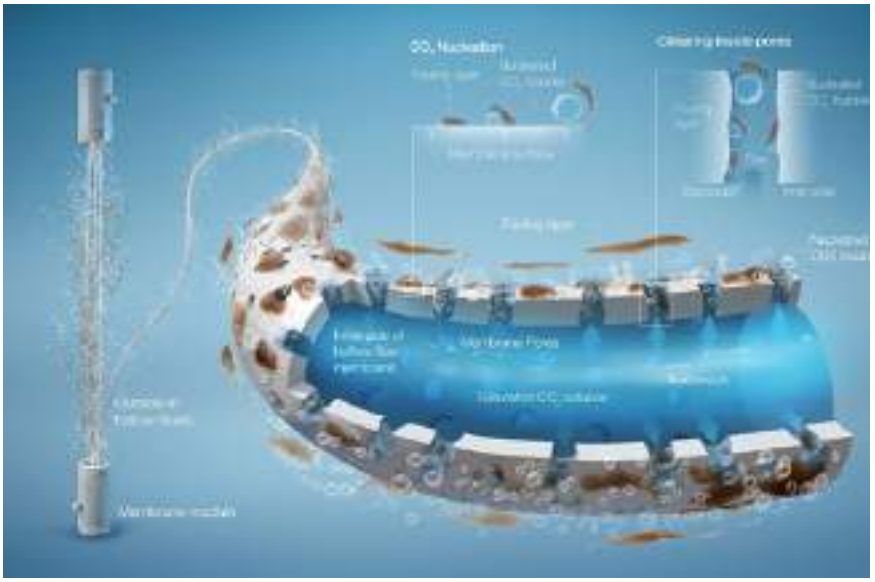
Growing populations are increasing the global demand for drinking water, but natural sources of freshwater are shrinking. Extremely arid countries, such as Saudi Arabia, increasingly depend on desalinated seawater.

The most effective desalination begins with ultrafiltration, which removes larger suspended particles and microorganisms. This is followed by the reverse osmosis phase, which draws pure water away from the salty solution through a dense membrane. Ultrafiltration prevents the reverse osmosis membrane from becoming clogged, damaged and unusable, but it also involves a porous membrane that must be regularly cleaned.

"The pretreatment stage is a very important part of seawater desalination," explains KAUST's student, Mohanned Al Ghamdi, "but cleaning the filters is not easy or environmentally friendly. Repeated use of strong chemicals can damage the membrane beyond repair."

Al Ghamdi and his Ph.D. supervisor at KAUST, Noreddine Ghaffour, have harnessed the physical and chemical action of carbon dioxide (CO_2) bubbles to pluck impurities from ultrafiltration membranes. The technique had been used to wash the surface of reverse osmosis filters, but had not been tested on ultrafiltration membranes, to unblock the pores through backwashing.

"We built the whole experiment from scratch," explains Al Ghamdi. "There was no lab when I started in 2009, so I designed the parts, and we manufactured them at the KAUST workshop."



After each hour of seawater filtration, a backwash solution is flushed back through the membrane to clear away the gathered impurities. The researchers created their backwash by dissolving CO_2 in water until it was suitably saturated. As this solution passes through the membrane, the pressure drops and CO_2 bubbles begin to grow, forcefully dislodging the dirt. "We just had to find the ideal starting pressure to enable the most CO_2 bubbles to form without damaging the membrane," explains Al Ghamdi.

In addition to the physical action of the bubbles, CO_2 dissolved in water creates carbonic acid, which also helps to break down the dirt. "We were surprised to achieve 100 percent recovery of the filter without the use of chemicals," says Al Gamdi. "Subsequently, the filter can be used again and again."

Better filter cleaning will reduce the time and expense of replacing damaged membranes, enabling the continuous production of safe drinking water. "We have provided an environmentally friendly cleaning solution that cuts out the use of potentially harmful chemicals," he adds.

Al Ghamdi explains that the team is now working on improving the technique to reduce cleaning times under different conditions. "It currently takes one minute of backwashing to clean each membrane, but we hope to half that," Al Ghamdi says.

With increasing demands for drinking water, size is just as important as speed. "We are already scaling up what we have proved to work in the lab through a range of pilot tests", adds Ghaffour.

RESEARCH ON THE NOVEL CO

APPLICATIONS AND KNOWLEDGE NEEDS

As the novel coronavirus outbreak hit country after country, and it became known that it could be shed in the faeces of some patients, research started to detect the novel coronavirus in wastewater.

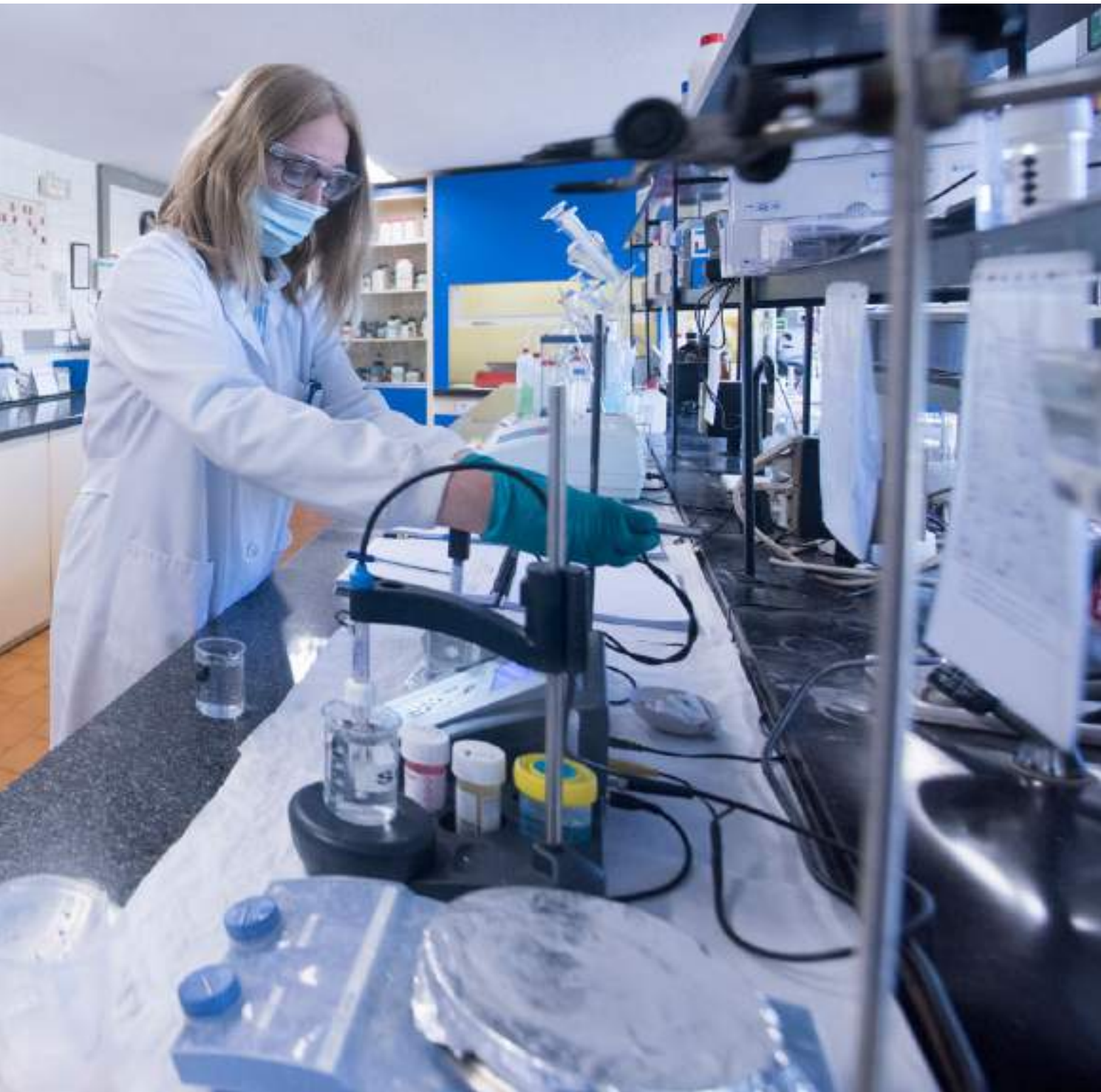
As the faeces from infected patients entered the sewage system, the virus has been found in raw sewage. According to the U.S. Centres for Disease Control and Prevention, it is not known whether this virus can cause disease if a person is exposed to untreated wastewater, but the risk of transmission of the virus that causes COVID-19 through properly designed and maintained sewerage systems is thought to be low. Furthermore, standard practices associated with wastewater treatment plant (WWTP) operations should be sufficient to protect wastewater workers from the virus.

Wastewater-based epidemiology (WBE) is a rapidly developing discipline that analyses certain pollutants and biomarkers such as pharmaceuticals, illicit drugs or pathogens in raw wastewater. Research on the presence of the novel coronavirus in wastewater is underway across the world, in an attempt to monitor the presence of the virus in communities.

It is generally regarded as a complement to directly testing individuals, limited in most countries because of resource constraints. Also, asymptomatic carriers are often not tested. This is where WBE comes in to provide additional information on the spread of the virus. It can provide an early warning of the possible re-emergence of the virus. Immediate applications include informing policy regarding disease control measures, and

RONAVIRUS IN WASTEWATER:

Cristina Novo Pérez - Pablo González-Cebrián



effective targeting of investment and efforts to control the pandemic.

Researchers worldwide are carrying out studies to monitor the presence of SARS-CoV-2 genetic material at WWTPs. Reverse transcription polymerase chain reaction assays (RT-PCR) are used to measure the amount of SARS-CoV-2 RNA in wastewater. Some institutions involved in this type of research include the KWR water research institute in the Netherlands, Cranfield Water Science Institute in the UK, the University of Arizona Water and Energy Sustainable Technology Center, Arizona State University, the University of Queensland and Australia's national science agency CSIRO, the University of Otago in New Zealand, and Ben-Gurion University in Israel, among others.

The novel coronavirus has been detected in raw wastewater, but not after

INTERVIEW

Professor Gertjan Medema
Principal Microbiologist at KWR

"SARS-CoV-2, AS OTHER CORONAVIRUSES, ARE NOT SPREAD VIA THE WATER CYCLE"

The water research institute KWR has detected gene fragments of SARS-CoV-2 in the influent of several WWTPs

The Dutch water research institute KWR has been testing substances in urban sewage water for almost ten years. When the coronavirus outbreak began and before the first case was announced in the Netherlands, KWR's researchers believed that the coronavirus SARS-CoV-2 could be found in sewage water from the stools of infected people, and have been working since then to detect it in wastewater treatment plants (WWTP).

Currently, there is a lack of information about the prevalence of the virus in the general population. Professor Gertjan Medema, Principal Microbiologist at KWR, explains that wastewater surveillance can help "health authorities monitor, on a population level, the

occurrence of the virus and, indirectly, give an indication about whether people are still infected." This type of information allows authorities "to monitor the occurrence of the virus in large populations over time, which is crucial if one seeks to determine the effect of measures taken to reduce its spreading."

Furthermore, it is "an ideal tool to determine if the virus and the epidemy are resurfacing, giving authorities time to identify locations where it is spreading and allow them to setup all the necessary measures to contain it", notes Professor Medema. "This means that if wastewater of a city (or multiple ones) is monitored continuously (or at regular intervals) in the months to come, it could be possible to detect the reappearance of the virus at a very early stage, with obvious advantages for authorities". He clarifies that "obtaining a number of infected people is currently not possible as we do not know how much virus each individual will release in their excretion (e.g., faeces)".

KWR has been carrying out a pilot study in a selected number of WWTP. Preliminary results detected gene fragments of SARS-CoV-2 in the influent of several plants as early as March. Efforts are under way to setup a national monitoring program together with other partners and the Dutch government. Professor Medema stresses that "SARS-CoV-2, as other coronaviruses, are not spread via the water cycle, because they are not as resistant to the environmental conditions in sewage as the noro- and hepatitis A viruses".

The risk for sewage workers is considered to be low. As Professor Medema emphasizes, "existing safety measures should be followed to guarantee security and these are still valid and considered sufficient". They ensure protection for WWTP workers from being infected by any pathogen potentially present in wastewater.

treatment. Based on current knowledge, it does not spread via the water cycle, and most water treatment routines are thought to kill or remove coronaviruses effectively in wastewater. However, there have been calls for additional research on the fate of the virus in the urban water cycle, noting that the effectiveness of sewage treatment methods has not been studied specifically for SARS-CoV-2.

Many questions still need answers, and scientists from different fields should join forces with governments and public utilities to address this critical public health issue. Michigan State University (MSU) water expert Joan Rose is leading efforts to collaborate with scientists worldwide, as chair of the COVID-19 Task Force for the International Water Association (IWA). Indeed, collaboration is a mainstay of plans for surveillance programmes being planned by several countries. Other coronaviruses have shown seasonality, so scientists warn that systems must be established to stay vigilant and prevent a potential return. Wastewater monitoring data can be integrated with health data to provide a powerful tool for decision-makers. Wastewater surveillance could be particularly useful for monitoring likely hot spots for new coronavirus entry and dispersion such as airports.

In the future, scientists hope to use WBE to not just detect the geographic regions where COVID-19 is present,

"Researchers worldwide are realising studies to monitor the presence of SARS-CoV-2 genetic material at wastewater treatment plants"

but to approximate the number of people infected without testing every individual in a location. There are many unknowns to get to that point. At the moment, researchers use molecular methods to obtain a number of gene copies per litre, which may depend on many factors: the extent of viral shedding in the faeces of infected individuals, the type of wastewater arriving to a WWTP (domestic, industrial, stormwater), degradation of the viral RNA, sampling methods, etc.

Moreover, it is not known yet if the virus remains contagious in sewage. Wastewater studies done so far use molecular assays that detect the genetic material of SARS-COV-2, but not the presence of the structurally intact virus or its infectivity. Infectivity (virus viability) may be determined via cell culture methods. Virus growth in cell culture indicates the potential for the virus to replicate in humans and cause disease. Because these methods require Biosafety Level 3 measures, many studies only include molecular assays. It may be that wastewater contains only non-infectious SARS-CoV-2 or just its genetic material.

Clearly, further research is needed to know the implications of the presence of the virus in wastewater, with knowledge gaps concerning the occurrence and survival of SARS-COV-2 in wastewater, as well as the removal by treatment processes. Next, we feature two interviews (you can read the full version in the Smart Water Magazine website) with scientists at the forefront of this research.

INTERVIEW

Dr Zhugen Yang
Lecturer in Sensor Technology
at Cranfield Water Science Institute

"TESTING WASTEWATER CAN PROVIDE EARLY WARNING OF INFECTIONS IN THE COMMUNITY"

Scientists are developing a quick, easy to use paper-based device to test for SARS-CoV-2 in waste water

Scientists at England's Cranfield University are working on a new test to detect SARS-CoV-2, the virus responsible for COVID-19, in the wastewater of communities infected with the virus. They propose rapid testing kits using paper-based devices to detect biomarkers in faeces and urine from disease carriers that enter waste water streams. The kits can be used on-site at waste water treatment plants.

Dr Zhugen Yang, Lecturer in Sensor Technology at Cranfield Water Science Institute, and head of this research, explains their method of testing: "As it is folded and unfolded, the sensor filters the nucleic acids of pathogens, which then react with preloaded reagents to reveal the presence of certain infections. The results can be seen with the naked eye, presenting as a green circle when positive." The method has several advantages: "This device is cheap (costing less than £1 (US$1.25)) and will be easy to use for non-experts after further improvement."

Dr Yang sais his team at Cranfield university have not tested wastewater in England yet, as their labs at the university had to close due to the pandemic. "However, we have already shown that our paper device is able to test nucleic acid in sewage for a proof-of-concept study," he reports.

The advantage of testing wastewater, explains Dr Yang, is it can provide an early warning of infections in the community: "This will significantly help governments to take proper prevention and effective intervention measures. Currently the test is designed as a rapid and cost-effective diagnostic tool for the mass population rather than individuals." Furthermore, he thinks that "these testing kits could also be used for individual diagnosis of SARS-CoV-2 with further development, as has been proved for malaria testing."

Cranfield University is working with other organizations and governmental bodies on this study: "At the moment, we have been sponsored by the UK's Natural Environment Research Council and Royal Academy of Engineering, which is enabling us to further improve the performance of the device. We have been approached by a water company for discussion on collaboration."

A key issue is the potential of wastewater to be a vector for the transmission of the coronavirus. In this regard, Dr Yang thinks "Currently it's difficult to say, but there is evidence to show that viral RNA of COVID-19 has been detected. It will also depend on the pandemic; as more people become infectious, a higher dose of COVID-19 may be present in sewage."

DIGITAL

PETER HERWECK

EXECUTIVE VICE PRESIDENT INDUSTRIAL AUTOMATION
MEMBER OF THE EXECUTIVE COMMITTEE, SCHNEIDER ELECTRIC

"We need to rethink the approach to cybersecurity"

Digitalization is one of Schneider Electric's hallmarks. A firm prepared for the abrupt changes brought on by the coronavirus pandemic in the water sector. We spoke with Peter Herweck, Executive Vice President of Industrial Automation of the company.

ALEJANDRO MACEIRA

Peter Herweck has over twenty-five years of experience in B2B environments, having successfully held various executive positions in Germany, Japan, China and the United States. He has extensive experience in multiple industry segments such as Pharmaceuticals, Food & Beverage, Metals, Mining and Transportation, as well as specializing in topics such as automation, the digital transformation of industry 4.0 and the development of long-term business strategies. In 2016 he joined Schneider Electric's Executive Committee as Executive Vice President of Industrial Automation, his current position as he gives this interview to Smart Water Magazine, focused on the company's response to the COVID-19 pandemic.

"Schneider Electric is recognized around the globe as an essential business providing service continuity to critical infrastructure"

The first question is a must. How is Schneider Electric dealing with the impact of COVID-19?

We at Schneider Electric have coordinated teams globally, regionally and locally to ensure business continuity and are fully focused on two key priorities:

★Ensuring the health & safety of our employees worldwide and implementing measures and protocols as per government directives.

★Ensuring that our customers' needs are fulfilled to the best of our abilities and leveraging our multi-hub global supply chain and service organizations to ensure business continuity and flexibility.

Schneider Electric is recognized around the globe as an essential business providing service continuity to critical infrastructure such as hospitals, data centres, IT networks, temperature-controlled food supply chain, energy, transportation, and water cycle management. Ensuring continuity of service 24x7, to critical industries in all the countries and communities where Schneider Electric operates is the Group's responsibility and its first contribution to the fight against Covid-19.

In addition, the Schneider Electric Foundation launched the *Tomorrow Rising Fund* to provide response, recovery, and resilience to the most affected communities with fundraising and volunteering activities.

This fund will support emergency, longer-term reconstruction activities and maintain education and professional training for the most disadvantaged in our communities. Schneider Electric commits the first investment to the fund and will match donations of employees.

The Schneider Electric Foundation launched the Tomorrow Rising Fund to provide response and recovery to affected communities

Our stakeholders, shareholders, suppliers and clients, will also have the opportunity to participate.

What is your assessment of the response of the water industry to this challenge?
The water industry turned to securing supply for their key stakeholders and focused on the management of their workforce and supply-chain. Besides operational impact, the industry reacted quickly to grant free water access to people who are in need, as many have had a loss of work.

In the United States, NACWA estimates the impact of the coronavirus on the water utilities to cost $12.5 billion.

How will this affect the future of the water sector globally?
With this deficit amounting to about 30% of US Municipal water market CapEx, this will have a noticeable effect on the industry. There are several potential ways out of this dilemma such as:
★Federal/National water infrastructure stimulus packages to help bridge the gap in funding.
★Private capital participation (PPP) may increase as well, since there is a lot of capital waiting to be deployed and water is a long-term growth market. It could drive both further privatization of the water sector and joint financing of critical infrastructure projects.

Energy savings projects which are still not as common in water as in other industries, can help water operators save money on OpEx which can be funnelled toward infrastructure projects. For example, we partnered with the City of Atlanta (USA) to implement the EcoStruxure solution for energy savings, measuring across their water and wastewater facilities, which will result in savings of $32.5 million in 15 years plus $17 million in future capital savings.

"Energy savings projects can help water operators save money on OpEx which can be funnelled toward infrastructure projects"

Although it was already a clear trend, the confinement of a large part of the planet has led to a huge leap towards the digitalisation of services. What is your insight about this?
This has been a trend for some time and it is set to continue, very likely on an accelerated trajectory for Digital Water or Smart Water. A very recent market research

publication (source: Bluefield Research) on the US and Canada projected an acceleration of Digital Water by an additional 2% to a total 8.7% CAGR (or an aggregated market volume of over $100m from 2019-2030) in this sector. We have experienced strong growth in the implementation of digital services across geographical locations. For example, our EcoStruxure Augmented Operator Advisor has been installed at a desalination plant and water treatment plant in Saudi Arabia and a water treatment plant in Chile. Additionally, our EcoStruxure Asset Advisor solution, which provides predictive maintenance for our customers' critical power equipment, has been installed within treatment plants located in Mexico, US and Columbia.

"The larger and medium sized utilities have long paved the way for usage of smarter and more digital technologies in the water space"

> To stay one step ahead, we need to rethink the approach to cybersecurity, upfront; it requires new levels of collaboration

Apart from the current pandemic, a few other drivers for digitalization include:

★Difficulty to find a capable workforce to replace retiring workers.

★Improvements in operational oversight, leading to an optimized cost structure and reduced spending.

★Better managing the assets by predicting failures before they occur.

★Increasing regulations leading to more sophisticated monitoring, early warning systems and reliable reporting.

Are those utilities who had previously invested in digitalisation responding better?

The larger and medium sized utilities have long paved the way for the usage of smarter and more digital technologies in the water space. In many cases, they couldn't have handled the complexities of their businesses anymore, if it hadn't been for progressive automation and digitization.

Another critical success factor is leveraging an ecosystem of partners. Small utilities don't have all the expertise they need in-house, so IT and OT partners are often essential to develop and support digital technologies.

Here, cloud-based systems and solutions will make a huge difference, because they don't require a large support footprint on the utilities' side and can be effectively hosted and managed by the large cloud and service providers.

Making sure these solutions are scalable and cybersecure will be both a major requirement but also an operational benefit. As we see more overarching regional management structures evolving in the water space, at least in certain countries, smaller players as members of cooperative structures, can profit even more from such solutions.

What types of digital tools are the advanced companies implementing and what is your advice for those just getting started in their digital journey?

We see a rising interest in anything that helps our customers reduce operating cost and extend the life of their assets. In fact, given our global presence in the water market we see this trend throughout all the regions. For example, we partnered with Acqua Novara, VCO in Italy and deployed a full EcoStruxure for Water solution, including telemetry, SCADA and integrated AVEVA software for water networks which resulted in a 10% reduction of water loss and 15% reduction in energy consumption.

We remind customers you don't have to rip and replace, and recommend they start with automation tools in plants and networks that are open and easily connected to existing systems. Asset performance management is one of the first digital tools customers can implement on their digital journey to deliver tangible ROI. Additionally, cloud-based software "Advisors" are both minimally invasive and allow supervising and performing diagnostics without touching the equipment.

Cybersecurity was already a priority concern before this crisis, but now it takes on a new dimension. Is the water industry prepared to deal with digital threats?

The water industry has made great progress over the years, but to stay one step ahead, we need to rethink the approach to cybersecurity, upfront. It requires new levels of collaboration in at least two areas. Our customers' ability to defend themselves is only as strong as the technology that manages and controls their operations, but it is a shared responsibility. Vendors are responsible for providing state-of the-art and sufficiently hardened cybersecure OT/IT products and solutions, which Schneider Electric takes very seriously. We deliver secure systems and solutions, following a "secure by design" lifecycle development process that has been certified to comply with the international cybersecurity standard. The certification warrants that cybersecurity is considered in every phase of our product development process. To keep technology secure, our customers are responsible for ensuring cybersecurity is and remains part of their operations lifecycle. Because an educated and aware workforce will frequently be their first and last lines of defence, they need to make sure everyone, everywhere is responsible for cybersecurity - we collaborate on this front as well.

Schneider Electric provides cyber assessments, audits, certifications and other training services to ensure our customers have clearly defined responsibilities and procedures, are always following and strengthening their site security practices and are adhering to industry best practices, especially the product and security guidelines we provide to keep their installations as secure as possible. That approach goes a long way to dealing with digital threats.

Let us talk about energy. It seems we are moving to a low-prices period. How can this impact water services management?

There is a connection between Energy and Water. Energy is needed to produce, enhance, treat and transport water throughout its cycle. Some sources estimate that 4% or more of the world's electrical energy is needed for that. There is no question that energy is one of the major operational cost factors in the water industry today, besides labour cost and other consumables.

While the reduction of energy cost can be a good thing for water utility operators on the surface, the availability of cheap energy may cause some to lose sight of their goals to reduce the energy consumption in their operations, as part of their total cost reduction efforts and necessary efficiency gains. That being said, in an environment where cost savings is more critical than ever, we encourage utilities to seize the opportunity that energy efficiency brings long term — in addition to saving the environment, it's also about saving costs. For instance, we deployed our EcoStruxure solution for integrated energy management at the Punta Gradelle wastewater treatment plant, built by Veolia WT in a tunnel, which resulted in 15% savings on energy consumption and 20% improvement on operational efficiency.

"We follow a 'secure by design' lifecycle development process certified to comply with the international cybersecurity standard"

We should see an increase in awareness and treatment in the coming years, which will benefit us all and ultimately also industries

Increasing health concerns and the need to relax fiscal policies could lead to countries stepping up investments on infrastructure that guarantees water quality. Do you think there can be opportunities in this area once the pandemic is under control?
As previously mentioned, many of the past crises were followed by increased infrastructure spending as a major part of national stimulus packages. In developing countries, the underprivileged are paying the highest price for water, even though in many of these regions tap water is very low cost or essentially free. The fact that this free water is often not safely potable causes people to buy bottled water at a significantly increased price, well more than the price we pay for drinkable tap water in developed countries. This is the highest form of social injustice, and something we urgently need to solve. In India, Schneider Electric has partnered with Harsha Trust and Pradan NGO to implement 220 solar water pumping systems impacting lives of 3,300 farmer families. The project has increased the area of cultivation thanks to pumping water to lands at higher elevation. The objective is to double the income of 30,000 farmers by implementing 4,300 solar microgrids to power 1,200 irrigation pumps, harvesting equipment and other agri-processing machines. For the more developed world, ongoing advancement in water sensors, analytics and monitoring systems will lead to a gradual increase of regulations to improve the quality of our drinking water. Today, what cannot be easily measured will often not be regulated, because the effects of some substances on humans aren't well known. Therefore, water will not be treated for potentially harmful substances such as runoff from agriculture or heavy industries, hormones and antibiotics, PFAS, microplastics or other contaminants. We should see an increase in awareness and treatment in the coming years, which will benefit us all and ultimately also benefit the various industries to improve their environmental footprint and sustainability.

Schneider Electric acknowledges this challenge by prioritizing water efficiency across operations through installing best practice technologies for water conservation. We are helping our customers drive their efficiencies across the entire water cycle, better manage their assets, as well as reducing their capital and operational costs.

APPLYING DATA-AS-A-SERVICE TO THE WASTEWATER SECTOR

A major concern with real-time monitoring networks is the accuracy and reliability of data. A 2017 study by the SWAN looked into Big Data management by water utilities. The DaaS approach could address the limitations identified.

AMIR CAHN, EXECUTIVE DIRECTOR, SWAN FORUM

In 2017, the Smart Water Networks Forum (SWAN) surveyed 23 global water utilities about their Big Data management practices, as part of a Water Research Foundation (WRF) study, including their barriers to adoption. The results showed that "Data quality" and "Lack of talent to run Big Data analytics on an ongoing basis" were identified as the greatest impediment factors, followed closely by "Lack of talent to implement Big Data" and "Data security." One potential change agent to addressing these pain points is the "Data-as-a-Service" (DaaS) model, an outsourced approach to data collection, delivery, and verification.

What is DaaS?

DaaS is an innovative business model transforming the way organisations gather, share and interpret data by accessing data on demand. In his book, "Data as a Service - Framework for Providing Re-Usable Enterprise Data Services," Sarkar defines DaaS as "a framework for designing and developing a set of reusable data services that are designed based on enterprise level standards". In recent years, DaaS has gained considerable momentum as enterprises across all sectors are moving towards a service-orientated architecture. In essence, DaaS enables users to only pay for the final analytics they wish to receive instead of purchasing and maintaining the equipment themselves. Thus, there are no sunk costs for hardware, data collection, storage or support with these risks remaining with the Data Provider. Additionally, DaaS relieves the obstacles involved in training and retaining staff to oversee the operational status of a network. As described by van Vugt and Jacobsen, there are also notable DaaS challenges, such as concerns over data ownership, data security, and affordability. However, one of the main features of DaaS is that the cost of data collection, cleansing, and analytics is known, making it easier to forecast budget expenses and plan ahead.

DaaS is an innovative business model transforming the way organisations gather, share and interpret data by accessing data on demand

Few guiding principles of DaaS according to Sarkar

★*Architecture not technology.* DaaS is an architectural framework, beyond a mere technology or application. Its underlying foundation is typically based on the concept of service reuse, enabling users to utilise common, standardised services over the web, the Cloud, and related technology for multiple purposes within an organisation.

★*Focus on data quality.* For any DaaS service provider, the quality of published data is the primary strategic asset that distinguishes them in the eyes of their service consumers. Therefore, it should be viewed as a key differentiator that must be exploited to drive market share by the data provider. The information fed to DaaS subscribers needs to be consistent, timely and accurate and meet all the SLA (service-level agreements) specified by business stakeholders with regards to quality and fitness for use.

★*Data governance challenge.* Data governance is often the most challenging aspect of a DaaS program due to the high degree of coordination required to gain consensus among multiple stakeholders on major governance issues. This is impacted by several items including local data laws (e.g. if the data must be encrypted), the support of data quality assurance, security and privacy compliance, data classification, information lifecycle, and auditing features that a DaaS system can support. Anyone considering a DaaS program should be aware that data governance is a critical success factor to the long-term growth and sustainability of data services across the organisation.

Within the water sector, DaaS is more commonly applied to wastewater operations with utilities outsourcing the operation and maintenance (O&M) of different services to outside private companies, such as for total wastewater system operations, combined sewage overflow (CSO) monitoring, water quality monitoring, and industrial pollution detection. To provide the required data, the Data Provider is responsible for acquiring and maintaining the necessary equipment to measure, collect, store, and transmit data to deliver reliable results. In different cases, a utility may choose to purchase the equipment themselves (e.g. flow sensors, level sensors, remote stations), rent the equipment, or only pay for the data they wish to receive. As a relatively new business model for the water sector, there is limited, existing information on how DaaS can impact utility operations and improve customer and environmental outcomes.

Next Steps

Despite several successful utility case studies for DaaS within the wastewater sector, there are still several unknowns, such as the questions listed below:

★What are the main utility motivations to implement DaaS? What are the biggest barriers?

★Is DaaS only suitable for utilities that do not have the capacity to install, operate and maintain their own network?

★How do utility DaaS practices compare across different wastewater applications, as well as across different sectors?

★How does DaaS improve the efficiency of utility operations and maintenance?

★Do DaaS utilities have improved regulatory compliance compared to non-DaaS utilities?

★Do DaaS utilities prefer to just acquire data, report summaries, or also predictive insights?

★What makes a utility an appropriate fit for DaaS?

Over the course of the next 6-9 months, I will investigate these questions by carrying out (1) a global utility survey and (2) an in-depth study of select utilities using DaaS for different wastewater applications to determine best data management strategies, data quality procedures, contract preferences, regulatory performance, and more. Each of these studies will be available for free to SWAN Members.

DaaS is an architectural framework, beyond a technology or application; the underlying foundation is based on service reuse

BIONS, A MORE SUSTAINABLE AND SMARTER MANAGEMENT OF THE WATER NETWORK

Integrated water cycle management is key for our planet's future. It is not only about supplying water, but doing it as efficiently as possible.

FRANK ZAMORA, ICT DIRECTOR, WATER BUSINESS, ACCIONA

Companies that, like ACCIONA, work on integrated water cycle management, also have the responsibility and the duty to work towards achieving efficient integrated water cyle management.

With this strong commitment in mind, ACCIONA has put BIONS (Business Intelligence Of Network Solutions) into operation, a cloud-based data intelligence platform, which integrates several sources to provide value-intelligence to the business and improve the management of the water supply system through water efficiency.

ACCIONA has put BIONS into operation, a cloud-based data intelligence platform which improves the management of the water supply

A comprehensive image of the service and the network

BIOS offers a comprehensive in depth vision of the service and the water supply network, and the "health" of the network.

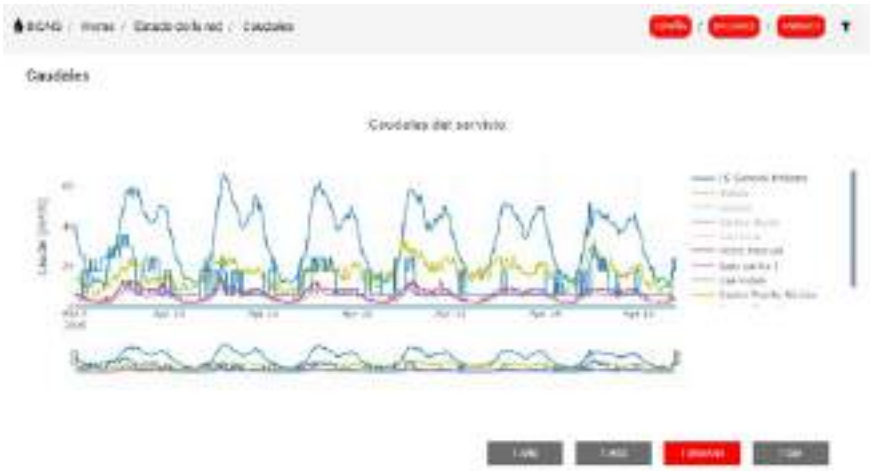
The tool continuously records all events taking place in the water supply network. It integrates several data sources: smart water meters for domestic use, district metered area (DMA) sensors, management systems for users and incidents, tank levels, GIS, meteorological data or calendar variables. The result is a platform with a graphic and mobile interface, where you can view what is happening in the water distribution network in real time.

Its architecture comprises the following modules: data intake, cloud gateways, data lake, algorithm and machine learning management, and visualisation.

This centralised information is afterwards used in decision making, as well as to define strategic actions and practices that optimise the performance of facilities.

BIONS allows detecting, predicting and analysing incidents in the water supply network such as leaks, breaks, faulty assets or problems with telemetry or operations

It helps us understand network operations better, optimise supply planning



and service levels, and thereby ensure the best water access for citizens.

One of the main objectives of BIONS is to improve response times to leaks, breaks, and pressure failures in the water supply network.

To do that, the platform manages and shows all the information that helps prevent and avoid important water cuts, and identify the causes of dirty water complaints or issues with the supply, among others. Ultimately, it allows identifying failures in the facilities before they occur.

On the other hand, BIONS performs analysis and management of water levels in tanks and deposits. This way, it can track the status of events (pressures, tank levels, etc.) and anomalies from beginning to end, thus ensuring enhanced water services for users.

Predictive models

Furthermore, thanks to the use of artificial intelligence and machine learning technology, BIONS enables going one step further, anticipating leaks and other anomalies, predicting the demand by tracking patterns and trends, and solving supply problems in a preventive manner.

For example, the demand can be predicted based on an estimate of the minimum night flow rate; non-revenue water can be analysed based on algorithms to calculate the water balance by district; even potential fraud-theft in the water network can be detected.

Incorporating artificial intelligence enables going even further in terms of the analysis and management of services and water facilities. With BIONS, data are turned into knowledge and future actions, achieving savings thanks to the early detection of hidden or underground leaks, improving response times to leaks, breaks and incidents in the water supply network, and ultimately ensuring greater water service efficiency.

It is a step beyond the classical approach focused on mathematical solutions and daily operations planning, towards a new model based on the recognition of patterns and machine learning.

Advantages of a smart water network

A platform such as BIONS offers undeniable advantages in terms of efficiency of the operations and maintenance of the network, shortening the cycles of repair and incident resolution.

It is a multi-channel platform, which can be accessed and operated from mobile devices, tablets and personal computers.

Because it is cloud-based it is fully scalable and can grow in parallel with the technological evolution of the network and the systems installed.

Another important aspect is its flexibility, since it can be implemented in systems with different levels of technological development and different control and sensor systems. The tool can be adapted to the information existing in each service.

On the other hand, the integration of the BIONS platform with the GIS positioning system has the advantage of providing a user interface based on a hydraulic model of the network, something that guarantees that the user experience will be swift and adoption easy.

One of the objectives of BIONS is to improve response times to leaks, breaks, and pressure failures in the water supply network

Cybersecurity

Smart water projects use technologies and tools for more flexible, competitive and efficient management. That requires better alignment between OT and IT networks and the cloud, to manage an increasing number of data and signs, something that entails greater security risks.

The BIONS cybersecurity architecture ensures not only protection from potential attacks to service remote control systems (industrial security), but also the security of data (industrial and transactional), of the IT network, and of the cloud platform.

A core component of security is the OT network. It includes the protection of automation and control networks for the water facilities against unauthorised access, as well as the control of all communications between the remote control system, the IT network and external networks, and the cloud, including transmission of encrypted data and authentication of communication nodes.

The result has been the implementation of a series of elements, like firewalls and filtering devices, industrial firewalls, network segmentation, profiles to access systems and/or segments of the network, to ensure security from attacks to the BIONS platform.

Similarly, we have implemented data treatment, validation and flow policies, to ensure compliance with data protection regulations for blocks of sensitive information such as user data or employee data, among others.

Cybersecurity risks are successfully reduced taking into account security criteria from the platform design phase, through the implementation of a comprehensive security architecture concept, integrating appropriate technologies and subsequent improvements in processes and measures dealing with the organisation, access and users' roles in systems. And BIONS is an example of this.

Detecting incidents

Moreover, BIONS has a continuous monitoring system/service that generates automatic alarms in case of incidents or failures. This applies to the performance of the technology platform, as well as potential errors that may occur in the process of data loading to the cloud, during the execution of artificial intelligence models or algorithms, data integrity in the data lake, etc. Also to incidents and alarms during the operation of the water service itself (leaks or critical incidents in the network, alarms due to the prediction of problems to satisfy a demand, tank levels, etc.)

In all of these cases, the alarm is shown in the platform and the person responsible receives a notification. To respond to any incident ACCIONA provides support 24x7, taking any pertinent corrective actions.

> **BIONS is not just technology or digitalisation, it is an initiative that provides real and tangible benefits to the business**

ACCIONA's commitment to technology

The BIONS project shows ACCIONA's commitment to technology as a way to optimise the management of water supply services.

During a first pilot phase that concluded in December 2019, a complete BIONS platform was implemented in two locations in Spain: Andratx and Zafra.

With BIONS, data are turned into knowledge and future actions, achieving savings thanks to the early detection of leaks

This led to putting in practice the model that integrated transactional data sources and remote control systems in the data lake of the business intelligence platform. In addition, descriptive and predictive artificial intelligence models for the operation and management of the network and water efficiency models to estimate water flow, detect and predict breaks, losses and incidents in the network, and analysis of water consumption-billing, have been defined and developed.

Currently the transactional sources from all water services in Spain have been integrated in the BIONS data lake, and integration with remote control systems for these services is under way, to be followed by the deployment of artificial intelligence models for network operation and management.

The end goal is for BIONS to be the smart management platform for all of ACCIONA's water supply services nationally and internationally.

Industry 4.0 is already a reality for water companies. A revolution that results from digitalization and the adoption of new technologies, which enable improved connectivity and access to information, turning it into knowledge.

And it is in this context where BIONS, a technological project, but clearly business oriented, seeks to transform and improve water supply services.

BIONS is not just technology or digitalisation, it is an initiative that provides real and tangible benefits to the business and, as ultimate beneficiaries, citizens receive a better service.

MINSAIT,
DIGITALIZATION OF WATER UTILITIES

Digitalization is here to stay, and just as it is changing all aspects of our lives - cities, homes or our leisure time - it is also revolutionizing business.

Liliana Velasco Pérez, Utilities Water Manager at Minsait

This ongoing trend, also known as industry 4.0, is essential to guarantee the competitiveness of companies. At Minsait, a leading company in digital transformation, our goal is supporting our clients by providing solutions aimed at generating positive impacts on their business and on society.

Although companies are taking leaps and bounds to catch up, the digital maturity of water companies still has a long way to go

A constant evolution is required to address the challenges faced by the industry, such as reducing production costs, speeding up responses to eventualities or improving customer experience.

Water utilities are not on the sidelines of this wave of change. Digitalization has led to the transformation of the water sector, becoming essential in most processes, both at the level of water infrastructure operation as well as commercial management and related corporate processes: financial, HR or marketing, among others.

The range of new tools includes several solutions, from the intelligent and automated management of the sensors deployed in the field, to the automation of processes through "Virtual Workforce", a wave in the digital transformation that is revolutionizing back office and front office operations.

All these new solutions contribute to improve the main water management areas, in terms of equipment connectivity, data homogenization, and process automation.

Nowadays, the global panorama intensifies water utilities' challenges. Climate change is a reality and so is the fight against water scarcity, worsened by inces-

sant population growth and increasingly stringent environmental regulations. For all these reasons, the sector is necessarily forced to integrate disruptive technologies into management.

However, although major companies are taking leaps and bounds to catch up, the digital maturity level of water companies still has a long way to go.

Based on our experience with utilities at the international level, where we carry out digital transformation projects, we identify three types of companies, based on their level of digitalization.

Companies in a premature state of digital development, where their efforts in the IT field focus on implementing basic functionalities of an ERP system, covering basic processes of commercial management, having a GIS system, as well as supporting the operation through a SCADA system.

Digitally conscious companies, which have redesigned most of the operations to have more automated and controlled processes. These companies are in a phase of consolidating their technology to be able to implement complementary functionalities. Digitally conscious companies usually implement more advanced modules of the systems, as well as solutions that enhance energy efficiency and the relationship with both internal and external customers through their virtual office and web portal. In addition, they develop pilot projects that allow them to validate the application of new operating models, validating and identifying the Business Case that deserves a future investment.

At the highest level would be companies with digital maturity, which are those that have consolidated their technologies. These companies still have room for improvement through the incorporation of advanced analytics aimed at optimizing strategic decision making, where data is a common asset for all areas. Similarly, the automation of processes reduces human intervention in low-value tasks, guaranteeing continuity and quality of service and making operations more efficient. To do this, they resort to the capabilities of robots, automated end-to-end monitoring and virtual replication of real processes.

It is essential to migrate from obsolete technologies to modern ones and adapt the business processes and logics to digitalization in order to improve in financial and operational terms. Additionally, companies must align their IT strategy with OT, as both are completely linked.

In order to face the digital transformation and promote new customer-oriented business models, we have developed *Onesait Utilities*, a complete suite of solutions focused on responding to new challenges and opportunities for utilities in the new digital age. In search of operational efficiency, the integration of these solutions is essential to provide water companies a unified performance vision.

Among the available solutions, the implementation of *Onesait Utilities Customers* allows the optimization of the commercial cycle, covering the different needs of the business areas and enabling a 360º view of all processes related to a specific customer.

It is also necessary for utilities to have the appropriate inputs, guaranteeing the

It is essential to migrate from obsolete technologies and adapt business processes and logics to digitalization in order to improve

reliability of the information obtained throughout the network. Access to real consumption, flow, pressure or water quality data allows the companies to take a step forward to implement flow control solutions.

In this field, *Onesait Utilities Metering* monitors assets and validates and certifies the measure. It also supports analysis and decision making by applying Artificial Intelligence (AI) through Machine Learning and integrating Big Data capabilities and functions such as forecasting demand. This is the way to drive progress towards a state of digital maturity.

Another factor of measurement accuracy in a water supply network relies on identifying physical leaks in the network. The more exact the procedures for the control of real and apparent leaks, the better we will characterize the volume of non-revenue water, which will favour the implementation of water efficiency plans with significantly more positive results.

To solve the problem of locating network leaks in real time and accurately, we have developed *Onesait Utilities Sensing*,

Onesait Utilities Sensing is a system for the detection of leaks and threats in pipes in real time based on DAS technology

an automatic system for the detection of leaks and threats in pipes in real time based on the use of DAS technology (Distributed Acoustic Sensor).

The system uses standard communication optical fibre, and monitors transport and distribution networks by transforming optical signals into alarms with an intuitive and functional user interface.

At Minsait we have a technological lab that uses simulation technologies on a 4-pressure bar hydraulic circuit. This way we can identify individual and simultaneous leaks in the network, as well as external threats, whether they are mechanical or manual disturbances.

It has been possible to identify leaks with a sensitivity of around 100 l / hour, as well as threats and their location in the pipeline with great precision, of approximately 5 meters. A single optical sensor equipment can monitor up to approximately 150 linear km.

The implementation of these and many other systems generates layers of complexity for operators and can even lengthen routine testing processes in control centres. That is why there is always a need for simplification and presentation of interfaces, in such a way that it is simple for new users and there are no barriers on the way to digitalization.

From the point of view of improving operational efficiency, we are applying hyper automation processes, where we combine multiple technologies such as Machine Learning (ML), RPA (Robotic Process Automation) and automation tools, and we help to apply them gradually in our clients. This process starts with the digitalization of content and processes, through the automation of repetitive tasks using robots and integrating support platforms that offer an analytical perspective, and finally evolving to the implementation of intelligent processes that simulate the human decision-making process. These technologies assist utilities in reducing costs, generating additional revenue, and minimizing risks.

In this way, with the application of all these new solutions, Minsait wants to be part of the revolution of the digitalization of the water sector, applying new disruptive technologies that will allow society to extract more information and build a responsible, competitive water infrastructure with a vision towards the future.

With the application of these new solutions, Minsait wants to be part of the revolution of the digitalization of the water sector

DR. RICHARD VESTNER

BOARD MEMBER OF THE GERMAN WATER PARTNERSHIP AND FORMER CDO OF DHI

DIGITAL WATER:
THE NEXT STEP TOWARDS WATER 4.0

Today, many digitally ambitious and mature water companies are investing in understanding and implementing H_2O Digital Twins. However, the full potential of a Digital Twin is only reached within a Cyber-physical System (CPS). This can help water management reach the next level of digitalization and intelligent automation and further improve understanding, flexibility and efficiency within Connected Data Environments towards "Hyperautomation". Here, a combination of advanced technologies is deployed to increasingly automate processes and augment humans.

What makes the difference?

If we look at the discrete manufacturing industry, where Industry 4.0 is established and already creates value for customers and companies, and isolate the essence of major 4.0 developments, it is: a) connectivity and b) autonomy in CPS.

A CPS is created when a physical product, process or system is monitored and controlled by its specific Digital Twin. The ability to influence the system's real behaviour is possible through a deep intertwining of real and computational components, including models, sensors and actuators. Cyber-physical Systems deploy methods of Augmented Intelligence to achieve an advanced degree of autonomy ("self-X" capabilities) and to use information from a digital network across and beyond system boundaries. Think of weather forecasts or population dynamics. Hence, vertical and horizontal integration of a Cyber-physical Water System is key.

How much of this can be applied to the water industry?

Business and process environments in the water industry can hardly be compared with ideal conditions in a smart factory; the degree of tasks that can be automated are lower, and water systems can cover wide and remote areas. In addition, next to an improvement of effectivity and efficiency, there are different drivers for implementation: while the manufacturing industry uses CPS to pursue individualization, improved adaptability and resilience are top priorities for water applications.

However, there are proven elements in Industry 4.0 that can serve as an inspiration. As indicated above, strategic goals define how far and how fast a full-blown 4.0 approach is applied to an end-user like a water infrastructure owner or operator. Integration of a Digital Twin into a CPS can federate Engineering Technology (ET), like numerical modelling tools, Information Technology (IT), e.g. networks and communication, and Operational Technology (OT), e.g. asset management and operational services. The resulting CPS is a strategic and tailored move to create the most sophisticated stage of prescriptive automation, in which the optimal decision is presented or even executed.

Leapfrogging is possible, but…

It is an ambitious goal to provide continuous information about assets, processes and systems and to (semi-) automate their behaviour. As a rule, the implementation is therefore gradual, since the solutions have to be integrated and operated in the existing ET, IT and OT of the user. The key to success is the standardization and interoperability of solutions, the training of operating personnel, the development of best practice methods, etc. Here, there is room for digital integrators and other digital water ecosystems partners, which are crucial for building a powerful CPS.

Technology openness and new business models with new actors in a digital ecosystem will help accelerate added value creation

Conclusion

Data management and analytics continue to have enormous growth potential in the water sector. Even offline simulations and data analysis are not mainstream, and many utilities and consultants are not yet fully materializing the investments in these technologies. However, these are the first steps to build transparency and knowledge with descriptive technologies and then evolve with advanced analytic tools to realize a Water 4.0 vision. Technology openness and new business models with new actors in a digital ecosystem will help accelerate added value creation. In any case, the water sector requires and deserves a sensible and acceptable approach.

SYDNEY DESALINATION PLANT

Sydney's desalination plant was built in response to the worst drought in 100 years, when Sydney's dam levels fell to 24%, and completed in 2010. Using reverse osmosis desalination technology to turn seawater into fresh water, it is key to Sydney's water supply security.

After two years of operation, the plant ceased production in 2012 and has been since then in a state of readiness, resuming operations in January 2019 when total dam storage levels across Sydney fell below 60%, the trigger for restart under the Metropolitan Water Plan. It started delivering water to the Sydney water network in March 2019 and reached full capacity in August 2019, producing 250 million litres of water per day – or about 15 per cent of Sydney's drinking water requirements.

Sydney's dam storage levels have since recovered and were above 80% by April 2020. Since 27 March 2020, the plant is no longer operating at full capacity but it will remain operational for at least six months to help ensure a flexible water supply and maintain drinking water quality.

The plant is powered by 100% renewable wind energy and requires about 38 Megawatts at full production. Once discharged to the ocean the seawater concentrate returns to normal temperature and salinity within 50-75 metres from the outlet, with no significant impacts on aquatic ecology beyond that area.

NEW $21.4 MILLION U.S.-ISRAEL CENTER AIMS TO DEVELOP WATER-ENERGY TECHNOLOGIES

A collaborative consortium of universities, industry and government will research new technologies at water and wastewater facilities

A U.S.-Israel team that includes researchers from the U.S. Department of Energy's (DOE) Argonne National Laboratory has received $21.4 million over five years from DOE's Office of International Affairs and Israel's Ministry of Energy to develop new technologies to help solve global water challenges.

Northwestern University and BGN Technologies, the technology transfer company of Ben-Gurion University of the Negev (BGU), will lead the multi-institutional effort, known as the Collaborative Water-Energy Research Center (CoWERC). The CoWERC center is part of The Energy Centers program, which is administered by the Binational Industrial Research Foundation (BIRD).

Increasing water stress around the globe is among the greatest challenges we will face this century, threatening all sectors of society. New technologies are sorely needed to expand supplies of clean water. Working at the intersection of water and energy, the team will research, develop and commercialize new high-performance methods for water desalination, purification and reuse. After being validated in the U.S. and Israel, the new technologies could potentially be implemented around the world.

CoWERC will focus on three areas of technology development: energy-efficient enhanced water supply, wastewater reuse and resource recovery, and energy-water systems. Technology development efforts will culminate in pilot testing at water and wastewater infrastructure facilities in both Israel and the U.S.

"Water and energy are inextricably linked: water purification and distribution are primary uses of energy, while water is essential for energy production," said Aaron Packman, who directs Northwestern's Center for Water Research. "CoWERC will enable us to develop new technologies that will reduce the energy needed for desalination, improve recovery of water and energy, and support safe water reuse."

"We can actually extract more energy from urban wastewater than the amount theoretically needed for its purification," said Moshe Herzberg, professor of environmental engineering at the Zuckerberg Institute for Water Research at BGU. "Therefore, our aim is to recover and conserve this energy as well as to recover the nutrients and reuse the treated water."

"Argonne's capabilities in materials research for water applications, from discovery to scale-up, will be key to delivering on CoWERC's mission" according to Seth Darling, who directs Argonne's Center for Molecular Engineering and will lead the selective and antifouling materials project within CoWERC.

The highly collaborative consortium includes partners from universities, industry and government, including Argonne, Yale University, Technion, DuPont Water Solutions, Evoqua Water Technologies, Fluence Corporation, Mekorot, the Metropolitan Water Reclamation District of Greater Chicago, Hampton Roads Sanitation District, CycloPure, AECOM, Anaergia, Current Innovation, Ma'agan Michael and the Galilee Society.

DIGITAL TRANSFORMATION, NOW MORE THAN EVER

GoAigua platform supports water utilities with business operations and becomes a key ally during the COVID-19 crisis

The ability to adapt is one of the characteristics that defines the success of companies. In a context of crisis, having a reliable solution for both telecommuting and remote operations management becomes a must.

GoAigua technological solution allows water service operators to have at their disposal all the information necessary to improve decision-making processes and guarantee the continuity of their service in an efficient and safe way. Thanks to its predictive capabilities, by means of advanced algorithms and the study of consumption patterns, the technology anticipates situations that may occur and offers the best solutions, saving costs and avoiding unexpected circumstances.

The situation that has arisen due to COVID-19 has meant the suspension of a significant part of economic activity, causing a change in consumption patterns at all levels, both urban and industrial. Given the context, the management of water supply, sanitation and purification is key, but so is limiting the exposure of workers to the virus.

GoAigua technology allows to obtain the right solutions for each of the possible scenarios and solve them with the maximum guarantees. In relation to the monitoring and remote operation of infrastructure, a good example is the remote control of microbiological risk in water. When confinement at home means that the tap is the main point of supply, ensuring water quality is particularly important.

The positive impact of technology is reflected in any action or need that arises at a time of crisis. GoAigua allows the identification of events for which on-site attention is necessary, optimizing the management of work orders to minimize the exposure of operators or customers to the virus. In addition, the delimitation of the search area for leaks shortens response times and duration of work in the field.

GoAigua also allows the control, monitoring and analysis of consumption at any supply point, letting us know if there are leaks in a public center (hospital, residence, school...) in order to take the appropriate measures. The system prioritizes the resolution of these incidents and generates specific work orders.

In relation to the operation of distribution and sanitation networks, the combination of mathematical models with technologies such as Artificial Intelligence and Machine Learning ensures a continuous supply of water. In addition, the simulation of critical scenarios allows the manager to anticipate events, thus avoiding possible incidents in the operation of the networks.

This system allows remote reading of consumption via IoT with no effect on the service, postponing visual checks. All the consumption information is available in the virtual office, where users can see their consumption, send their readings and even pay online.

In short, GoAigua technology is helping water utilities adapt to the new context of crisis, ensuring the continuity and quality of water services, regardless of the time of day.

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UTILITIES

AFRICAN CITIZENS

GIVE A FAILING GRADE TO THEIR GOVERNMENTS REGARDING WATER

An Afrobarometer report on water and sanitation in the African continent provides us with valuable insights on what citizens are experiencing in their daily life, through the voices of more than 45,000 interviewees.

CRISTINA NOVO PÉREZ

Every so often we hear accounts of the dire situation in the African continent regarding access to water and sanitation. UN-Water reminds us every World Water Day of the billions of people in the world that still don't have these basic services. And the COVID-19 crisis is reminding us of why clean water and sanitation should matter to us. Although we are appalled by the numbers of the current pandemic, unfortunately other figures, maybe because they are so often heard, don't seem to leave a lasting impression on us.

A report released last March, Afrobarometer Dispatch No. 349, on water and sanitation, provides us with another point of view on the water and sanitation data. It comes from over 45,000 interviews done from September 2016 to September 2018 in 34 African countries, home to almost 80% of the people in the continent. Prepared by the Afrobarometer, a non-partisan, pan-African research institution conducting public attitude surveys on democracy, governance, the economy and society in over 30 countries, it gives us a fresh insight, from on the ground face-to-face interviews held in the language of choice of the respondent.

The strength of the Afrobarometer's data is that respondents are the best judges of their own interests, so they are the ones who can best express how is their quality of life, even if not with great precision. It uses the Lived Poverty Index (LPI), a measure based on a series of survey questions about how frequently people go without basic necessities in the course of a year. It includes enough food, enough water, medical care, etc.

UN-Water reminds us every World Water Day of the billions of people in the world that still don't have these basic services

Botswana survey team looking at survey maps

The report finds little progress towards UN SDG no. 6, Clean Water and Sanitation, when the results are compared with Afrobarometer data from previous surveys. Although the findings vary widely from one country to the next, the analysis indicates that about half of Africans surveyed report they do not have enough clean water for domestic use. This is particularly important because it hinders proper hygiene to prevent the spread of infections, as the current coronavirus crises has brought to light. People in rural areas are the most disadvantaged when it comes to access to water and sanitation services.

Poverty and SDG targets

In the year prior to the survey, 49% of citizens did not have enough clean water for home use, a form of lived poverty. Although clean water shortages had decreased from the 2011-2013 survey (39%) to the 2014-2015 (34%), the data for 2016-2018 show a new increase.

In terms of SDG 6 targets, 54% of respondents live in areas with a piped-water system that most houses can access, but the per cent varies to a great extent across countries, from only 8% in Liberia to more than 90% in Botswana, Tunisia, Sao Tomé and Principe, and Mauritius. When asked whether there was a sewage system in their area that most houses can access, the results also differ widely across the continent, with 9 countries where the answer is 10% or less, all the way to 75% in Tunisia; however, in this case the 34-country average is only 26%. If we consider the average across countries, there seems to be no improvements in terms of expanding water or sanitation infrastructure to a larger proportion of the population than in 2011-2013.

Daily life

52% of the people have to leave their compounds in order to get water. There are huge differences between urban areas, where 68% of the people have their main source of water for household use inside their house or compound, and rural areas, where that per cent drops to 31%.

72% of respondents say they have a toilet or latrine in their home or compound; another 22% have to go outside their compounds, and 7% report no access to a toilet or latrine. While the average figure for the continent shows no improvement when compared with the 2011-2013 surveys, there are countries with important increases in the per cent of citizens with toilets and latrines (Niger, Burkina Faso, Nigeria, eSwatini and Ghana).

Trying to get utility services

This is an interesting aspect that other sources of data, such as official stats, do not necessarily capture. People were

20% of respondents reported having to pay a bribe or do a favour to government officials in order to get the utility services needed

asked if in the previous year they had tried to get water, sanitation or electric services from government. If the answer was yes, the follow up question was how difficult was it to obtain that service. Only 36% said it was easy or very easy. Moreover, the per cent has declined from the 2014-2015 data.

A disturbing result is that 20% of respondents reported having to pay a bribe or do a favour to government officials in order to get the services needed.

Do people think that water and sanitation services are important?
On average, respondents from the 34 countries rank water and sanitation in third place of importance, together with infrastructure/transport/roads, and after

PROF. E. GY
Co-founder, board chairman, ar

"PUBLIC OPINION IS NO PART OF AFRICA

We interview Professor Gyimah-Boadi, co-founder, chairman on the findings of their recently releas

2019 marked the 20th anniversary of the Afrobarometer, the world's leading source of high-quality data on what Africans are thinking. The research of this nonprofit gives citizens a voice in policy making thanks to the funding from various organisations and institutions that include private foundations and international development agencies. On the occasion of the release of their report on water and sanitation (Dispatch No. 349) last March, we had a chance to interview Professor Gyimah-Boadi, co-founder, chairman of the board of directors and interim CEO of Afrobarometer.

How are Afrobarometer's results used by governments, international organisations, researchers and others?
Major international organizations and development partners routinely use our data in their strategies and programs. We contribute to global and continental governance indicators by the Mo Ibrahim Foundation, the World Bank, the African Development Bank, the Economist Intelligence Unit, and many others.

At the national level, we see governments use our data in white papers, parliamentary debates, public speeches, and so on, as when the leaders of Ghana and Sierra Leone cite our findings on corruption as part of their anti-corruption efforts. We work hard to put the data into the hands of government officials. But we would like to see governments use our data more systematically and proactively, because using public opinion in policy development and monitoring, rather than just responding to it, would make for better policy decisions and implementation.

"IF AFRICA IS SPARED THE WORST OF COVID-19, WE WOULD BE CRIMINALLY FOOLISH NOT TO HEED THE WARNING THIS PANDEMIC HAS GIVEN US"

Another area where I think our data could be used more is in support of the UN Sustainable Development Goals. For 12 of the 17 SDGs, our data provides a kind of "people's perspective" on how a given country is performing. We plan to start releasing SDG scorecards for surveyed countries that might help focus attention on areas where action is needed, including water and sanitation.

In addition to widespread coverage of our findings in the news media and on social media, perhaps one of the most important uses is by civil society, ranging from LGBTQ activists in Botswana to anti-corruption activists all over the continent.

There's an extensive academic literature based on our findings, and investors find our data useful, too. Pretty much anyone with an interest in Africa can benefit from knowing what Africans are thinking, and Afrobarometer is the best source for data on that.

We also make all of our data available for free via our online data analysis tool, so anyone can do their own analysis.

You provide high quality public opinion data. To what extent do you think it influences decision makers in Africa and beyond?
It definitely plays a role, because policy decisions these days have to be "evidence-based," and citizens' experiences and assessments are part of the evidence. In fact, this on-the-ground evidence provides a kind of independent reality check on other sources of data. Of course people tend to seize on data that supports the position they want to promote, and dismiss data that doesn't. But over time, I think it has the power to help set the agenda or shift the debate. If we consistently report that average citizens say the police or judges are corrupt, it becomes pretty hard for the government to act as if there's no problem.

This is where civil society, activists, and interest groups play a critical role. We can make sure the data is available, but it's really the stakeholders who use it that make it powerful.

So decision makers encounter our data not only in our reports but also in "official" global indicators, in development partners' strategies, in the news media, in civil society activism... When I think back to how it was when we started 20 years ago, when the voices of ordinary African citizens were basically

unemployment (1st place) and health (2nd place). Water and sanitation is essential for health in these countries, but respondents are not necessarily making that link.

Most importantly, water and sanitation is more likely to be identified as a priority by people in rural areas, those with less education, or the poor, which makes sense as they have the highest needs.

Given all of the above, it is not surprising that 54% of citizens from the 34 African countries surveyed think their government is letting them down concerning a priority for them: providing water and sanitation services. Only in nine countries did the majority of the respondents approve their government's performance in providing water and sanitation services.

VIEW

IMAH-BOADI

nd acting CEO of Afrobarometer

OW AN INDISPENSABLE AN DEMOCRACY"

n of the board of directors and interim CEO of Afrobarometer, ed publication on water and sanitation.

absent from policy debates, the change is remarkable. Public opinion is now an indispensable part of African democracy.

What are the main challenges that slow down progress towards SDG 6, clean water and sanitation for all, in African countries?
Corruption undermines so much that should be possible in Africa, including provision of clean water and sanitation. But beyond that, it's largely a question of priorities.

Of course there are so many competing priorities in Africa. In our surveys, the top priority for government action is always unemployment, and it's a huge one. But water and sanitation was the fourth-highest priority in our last survey round – ahead of education, economic management, poverty, food security... Governments and international development partners should listen to these priorities.

And again, civil society and the media play a vital role here. Even in imperfect democracies, the squeaky wheel is more likely to get the grease.

In your Dispatch No. 349 you identify corruption as one of the barriers people find to obtain utility services. To what extent do you think it is a significant barrier to water security (in the context of other challenges), and what efforts are you aware of to address it?
Corruption related to accessing public services is a significant burden, amounting to an unofficial tax on the poor. In fact, our research shows that the poorest citizens are almost twice as likely as the wealthiest to have to pay bribes in exchange for public services. Water security is a complex problem, but the idea that even where the necessary infrastructure exists people have to put up with extortion by corrupt officials is just maddening. Citizens see this clearly: only one-third (34%) think their government is doing a good job of fighting official corruption. Unfortunately, twice as many (67%) say people risk retaliation if they report corruption.

In every country that I know of, people of good will are fighting against this canker. Sometimes a combination of reliable data and public attention can move things in the right direction. In Ghana, for example, our reports on corruption were followed by a strong and sustained response by the media, civil society, and the general public – the radio talk shows went wild. This has led to public responses and reforms by the police, the judiciary, and political leaders, including the president. We haven't solved the problem yet, but it's definitely on the public agenda.

There has always been a clear link between water and health, but the current coronavirus crisis has brought it to light. Do you think this realisation will lead to water and sanitation becoming a higher priority for governments and international organisations?
Yes. I'm an optimist. If by some miracle that we're all praying for, or through decisive government action, Africa is spared the worst of COVID-19, we would be criminally foolish not to heed the warning this pandemic has given us. That places both health care and water/sanitation at the top of lifesaving priorities.

"THE MOST IMPORTANT POSITIVE TREND IS THAT AFRICANS STILL WANT DEMOCRACY AND DEMAND ACCOUNTABILITY FROM THEIR ELECTED OFFICIALS"

Based on your research, what do you think are the most important trends regarding access to water and sanitation?
Well, two of the most important "trends," unfortunately, are negative: COVID-19 and climate change. Both are putting, and will continue to put, increasing pressure on governments and international development partners to prioritize action on water security. It will increasingly be a matter of life and death.

The most important positive trend, I think, is that Africans still want democracy and demand accountability from their elected officials. This is where citizen demand for action on water and sanitation will ultimately succeed.

FINANCIAL CHALLENGES OF THE COVID-19 EMERGENCY FOR U.S. WATER UTILITIES

AWWA and AMWA release two reports on the financial challenges U.S. water utilities are facing due to the current health crisis

Two recent publications give some insights into the financial implications of the COVID-19 emergency on the American water sector.

First, the American Water Works Association (AWWA) published the results of an online survey on the impact of the COVID-19 emergency on its member organisations. It is the second survey by the AWWA on this issue: respondents include more than 500 utilities, mostly from the U.S. with some Canadian participants.

According to the survey, utilities are reacting swiftly to the crisis to guarantee essential services and business continuity, but two thirds expect revenue/cash flow problems within the next two months. In an earlier survey, only 14% anticipated financial implications. The two factors causing financial uncertainty are changes in water demand from non-domestic customers and customer payments during the coronavirus pandemic. The two major challenges utilities identified are ensuring social distancing of the work force and supply chain issues for PPE. In terms of regulatory compliance, an issue noted was problems to access sampling sites. Most utilities have implemented measures to help customers: more than 90% have suspended water shut-offs, and nearly 50% have restored service to suspended accounts.

Second, an analysis on the Financial Impact of the COVID-19 Crisis on U.S. Drinking Water Utilities prepared for the AWWA and the Association of Metropolitan Water Agencies (AMWA) indicates that the decline in revenue could lead to reductions in economic activity of up to $32.7 billion, and the loss of 75,000 to 90,000 private sector jobs.

The aggregate financial impact of COVID-19 on drinking water utilities has been estimated at $13.9 billion, amounting to 16.9 per cent overall on the drinking water sector. The factors contributing to revenue losses include elimination of shut-offs, anticipated increased delinquencies, and decreased commercial revenues; increased residential consumption partially offsets losses.

Future revenue losses due to deferrals of water rate increases are estimated to reach $1.6 billion, so the total impact of the crisis will exceed $15 billion. These figures are not far off from the conservative estimate of a $12.5 billion impact on clean water utilities as a result of lost revenue due to coronavirus calculated by the National Association of Clean Water Agencies.

Drinking water utilities in the U.S. are anticipated to delay and reduce capital expenditures due to these financial impacts, up to $5 billion (annualized). The reduced investment will have consequence on economic activity, resulting in the above quoted reduction in economic activity of $32.7 billion (annualized) when taking into account economic multiplier effects.

The report extrapolates similar impacts to wastewater utilities, obtaining an impact on the wastewater sector in the range of $12 billion; therefore, the combined water and wastewater sector impact of the COVID-19 crisis is calculated to be over $27 billion.

WATER UTILITIES TAKING STEPS TO PREVENT DISRUPTIONS AND ASSIST HOUSEHOLDS

Utilities are responding quickly to the COVID-19 crisis to ensure essential operations and business continuity

With water and wastewater critical to fighting the coronavirus (COVID-19) pandemic, water utilities are swiftly employing plans to prevent service disruptions and assist households struggling to pay water bills, according to a recent survey conducted by the American Water Works Association (AWWA).

Ninety-seven percent of the 532 responding utilities have measures in place or in development to keep essential field workers on the job. Ninety-five percent of the responses indicate they are assessing options for staff shift change policies to incorporate social distancing at the workplace.

The two most pressing challenges reported by utilities are social distancing of workforce and supply chain issues for personal protective equipment (PPE). Nearly 40 percent of utilities reported disruptions in the supply chain for PPE, and nearly three quarters are expecting disruptions in the future.

Conducted online, this marks the second in a series of surveys of how AWWA member organizations are adapting to impacts from the COVID-19 pandemic. The second survey of AWWA member organizations generated 615 responses, including from 532 different utilities and 81 non-utility responses (consultants, manufacturers, service providers and others). The responses offer a near real-time assessment of how water sector organizations are currently managing risks of the COVID-19 pandemic.

To assist customers impacted by the economic fallout of COVID-19, more than 90 percent of responding utilities have suspended water shut-offs and about 67 percent are waiving late fees. Additionally, some utilities indicate they are providing payment plan options, waiving charges like service fees, and a few are considering rate reductions or forgiving payments for one billing cycle.

The survey also showed utilities are concerned about potential revenue challenges, with 64 percent of utilities expecting financial implications in the coming months and about 10 percent are already seeing revenue reductions. AWWA and other water sector organizations are advocating for the inclusion of water sector funding in future stimulus bills.

For the service providers who provide critical support to the water sector, 80% of those surveyed say they are already or anticipating seeing revenue or cash flow issues, up from about 50% in the first survey. Almost all who carry out field service operations, like equipment maintenance, have developed plans to ensure they continue their essential support services. Finally, over 80% say they are adjusting staffing protocols to match the new economic reality.

Sixty-seven percent of utilities reported that they have business continuity plans in place, and another 20 percent are currently developing them. AWWA is encouraging utilities to take advantage of Business Continuity Planning for Water Utilities: Guidance Document (AWWA, Water Research Foundation, U.S. EPA, 2013) in assessing their plans.

WHATSAPP INITIATIVE DRIVES INTERNATIONAL COVID-19 COLLABORATION

Innovative use of communications technology: a social media chat group allows utilities from around the world to share learnings and experiences

A WhatsApp group intended for a handful of utilities to share learnings and experiences of the COVID-19 pandemic has quickly scaled to involve over 180 organisations. Isle founder and chairman Piers Clark started the social media chat group just over two weeks ago as the lockdown of populations meant utilities had to respond rapidly to multiple unprecedented challenges.

Clark said, "Initially there were 10 utilities involved, but it seemed sensible to extend that out and after a few emails, within 72 hours, we had 80 utilities from around the world. Within 10 days we were at 140, with participants from every continent, and the number is continuing to rise each day."

The key points are shared in a weekly webinar. The COVID-19 Update, hosted by Piers Clark, takes place twice on Thursday to accommodate global time differences – at 7.30 and 16.30 BST.

Clark said issues on the technical side have been around contamination and reuse of personal protective equipment, asset management and the impact of changes in demand on models for water network management. Companies are also learning a lot about smarter working and the benefits of letting employees work from home.

"There has also been a lot of interest in some research recently completed in the Netherlands to monitor the virus in communities via wastewater samples," Clark revealed. "More recently people are asking about modelling of the financial impacts on organisations and changes in the way rates are charged and collected.

CONTINUITY OF UTILITY SERVICES IN THE U.S. DURING THE COVID-19 EMERGENCY

Health authorities advised local and state authorities to ensure water services would not be shut off

A number of U.S. states have taken steps to ensure household utility services are not suspended due to lack of payment during the COVID-19 emergency. Health authorities at the national level advised local and state authorities to ensure water services would not be shut off, so that people could follow handwashing hygiene recommendations. Some states have followed this advice, but others have been slower to act.

According to The Guardian, less than 60% of the population in the U.S. has so far been protected from water shutoffs. Millions of Americans risk losing water services if they don't keep up with payments, at a time when the pandemic has caused unemployment to sky-rocket.

On another front, because utilities provide critical services, companies already had contingency plans in the event of a pandemic, even storing food on-site in case critical workers had to isolate from the general public to avoid becoming ill. Outside of Albany in New York, electrical grid support staff are isolated from the outside world since March 24, as part of emergency measures to ensure the continuity of services.

On the other hand, some utilities could face financial difficulty as a result of the pandemic. The utility sector has always been an investment haven because the demand is guaranteed. However, there have been reports of almost 30% losses in the sector, year to date, and things could get worse. The shutting down of business will reduce the demand in the coming weeks.

STUART WHITE
HEAD OF MEDIA RELATIONS AT THAMES WATER

HOW BRITAIN'S BIGGEST WATER COMPANY IS TACKLING THE CURRENT HEALTH PANDEMIC

I'd like to start by thanking everyone in the water industry for their complete dedication to maintaining essential services during these challenging times. It's never been more important to keep pipes flowing and I've been extremely impressed, but not surprised, by the way the industry has pulled together to take care of the nation.

Our public value and customers' appreciation has been noticed and felt. Often taken for granted, the lockdown has raised the profile of utility companies, and it's our opportunity now to ensure this closer connection has a positive and lasting benefit. We're all going without a meal in a restaurant or sunny day on the beach, and we're surviving, but it's clear we can't live without essential water services.

The situation we are in is unique, especially the social distancing measures, and we've had to adapt. Having utility workers classified as key workers early was important. We moved to home working for those who can very quickly, and we found new technology solutions for other key functions, like call centres, soon after. The use of Microsoft Teams, our internal digital solution, is up nearly 100% in April and it's been extremely effective in keeping people connected. As a media team, we are holding daily face-to-face catch-up meetings digitally and are able to share content, media alerts and information centrally.

I've been extremely impressed, but not surprised, by the way the industry has pulled together to take care of the nation

To protect those working on our sites, including the large water and sewage works in the capital, we restricted access to non-essential visitors immediately. Another key part of our continuity plan included looking at how we can bring in extra or redeploy existing staff to fill critical roles. We have been re-training people and even speaking to those who have left the company for potential emergency cover.

To support those working on our vast network, which stretches 109,000km, we ran a media awareness campaign at the start of the lockdown. It was important the community knew they could expect to see Thames Water engineers in the street still out working. This 'key worker' messaging has since flowed through all our news releases. To further reduce the risk of supply interruptions, we've bolstered our 24-hour rapid response team by minimising planned work and to get to an incident quicker. The quieter roads are helping, especially in London. Non-essential work, such as meter readings, have been cancelled, and staff are only entering customers' homes for emergencies.

To comfort our workforce and send a sign of reassurance to our customers, we confirmed we would not use the Government's coronavirus job retention scheme to furlough any of our 6,000 employees. While we continue to assess the impact on our business and adapt, it's clear all of our people have an important role to play – as water and waste services do not stop.

It's also important to note that we're doing all we can to support the communities we serve in other ways. This includes a wide range of options for those who are facing financial difficulties as a result of the crisis.

As mentioned, the industry has really pulled together on this. We're all open to the unique challenges we face and are willing to help with any rising issues. These cross-industry workstreams were established for Brexit and are robust. The fact they were already in place gave us a flying start, as we know each other and were able to get into a normal working rhythm very quickly.

Looking forward, we're now looking at plans on how we can start to return people to work. It will be no surprise we believe testing individuals is key, although the care sector must take priority. If we know individuals may have immunity, for example, they carry less risk.

Today, the future is uncertain. I lost Glastonbury, my family holiday to Portugal in July is surely off, I might not get to celebrate Liverpool winning the Premier League, but the main thing is we stay safe and bounce back. This a change moment for us all.

IT'S TIME TO TAKE A STEP FURTHER

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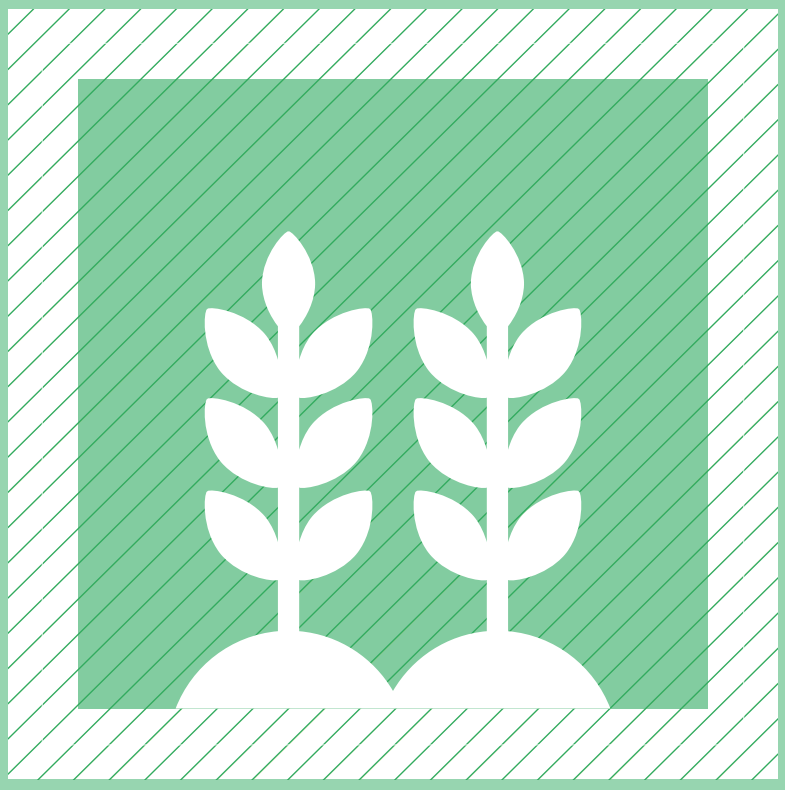


SDGs

GONZALO DELACÁMARA

HEAD OF THE DEPARTMENT OF WATER ECONOMICS, IMDEA WATER INSTITUTE, AND WATER POLICY ADVISOR TO THE EUROPEAN COMMISSION, THE

THE GLOBAL COVID-19 PANDEMIC AND A FALSE SENSE OF (WATER) SECURITY

In psychology, the Need for Drama (NFD) is described as a complex trait of poorly adaptive personalities who tend to manipulate others from a position of victimism. In social terms, it is interpreted as the tendency to propose catastrophes and apocalyptic thoughts to demand aid and encourage mass mobilization.

Yet, our selective reaction to different dramas is quite baffling indeed. The expansion of the outbreak of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) worldwide, illustrates one of the contemporary dramas that, in my view, is worth reflecting on: the relative loss of freedom in the name of increasingly demanding responses to preserve security.

Freedom and security are two inherent elements of any democratic society. As citizens, we are constantly debating, often without our even realising it, between defending our right to decide individually and the complexity of social conflicts in which, on many occasions, rational individual decisions lead to unsustainable collective outcomes, as in the so-called Isolation Paradox, enunciated by Amartya Sen, Nobel Prize Laureate in 1998. The need to adapt to climate change and to guarantee long-term water security is a good example of that. Ultimately, environmental conflicts are but a particular case of those social conflicts.

Long-term water security or the ability to adapt to climate change are public goods. However, we tend to downplay their relevance

In August 2019, which now feels like an eternity ago, the World Resources Institute (WRI), a think tank based in Washington D.C., updated the results of its far-reaching Aqueduct project. It showed that 17 countries (12 of them in the Middle East – not any region in terms of geopolitics), where already a quarter of the world population lives, suffer from extreme water stress. Spain hits 28th in the ranking: two thirds of its territory are at risk of desertification, as they are arid, semi-arid and dry sub-humid areas subject to strong pressures in terms of water abstraction and emissions of polluting effluents.

In the presentation of that report, Andrew Steer, President and CEO of the WRI, said: "Water stress is the biggest crisis no one is talking about. Its consequences are in plain sight in the form of food insecurity, conflict and migration, and financial instability." No one will be able to tell Dr Steer he did not warn us. (In September 2019, the Global Preparedness Monitoring Board, GPMB, co-convened by the World Bank and the UN World Health Organization, published its annual report, A World at Risk, in which it alerted of an increasing risk of severe epidemics and showed that the world, with almost no exception, was still unprepared. By paying attention to those experts, we would have possibly avoided a great deal of medieval fear and painful lockdowns).

Citizens do not demand water *per se*. It is not an end in itself. What they do need is security: to feel reassured that their well-being will not be threatened (be it by lack of income, any form of violence, a serious threat to public health, extreme phenomena with the potential to cause damage...). Within this context, citizens demand a guarantee that water will neither be scarce as compared to their needs, nor too abundant with respect to their ability to manage floods, nor contaminated by toxic, hazardous substances... Long-term water security or the ability to adapt to climate change are public goods. However, as a society we tend to downplay their relevance, focusing on instrumental issues such as we did when damaging the strength of our public health system in general, or our epidemiological services in particular, let alone our investments in research, technological development, and innovation.

As in the case of COVID-19, when managing water resources and climate change impacts, we will be doomed to endlessly manage crises (i.e. increasingly intense and frequent droughts and floods), unless we move towards risk and opportunity management. In other words, it is essential to progress from *ad hoc*, reactive, impact remedial, sometimes unplanned approaches, towards proactive, pre-emptive and planned ones. As anyone

feeling insecure would know (whatever the reason might be), there is no greater loss of freedom than pervasive insecurity, which prevents us from leading the life we long for.

Health, social and economic crises triggered by the global COVID-19 pandemic provide us with a good opportunity to draw some lessons regarding the design and implementation of public policies. Those lessons also apply to water resources management and climate change adaptation and mitigation, between which there are often ignored synergies.

I do not intend to be exhaustive, by all means, but it is worth exploring some of the lessons to be drawn from the current crisis in the face of upcoming critical events.

It seems of paramount importance to emphasize on the need to make decisions based on scientific evidence, something that entails, among many other things, reinforcing our capacity to generate relevant and verifiable information. All these global challenges show the value, the urgency, and the upmost importance of solid and accurate knowledge, striving to separate facts from hoaxes and to immediately discern the voices of those who really know from tricksters and charlatans.

We need worldwide governments with greater capacity, more intense and effective cooperation, stronger multilateral institutions

It is also critical to acknowledge that whatever is global is also local to a large extent; that water security, like health, is not a local matter at all – whatever happens to others, to everyone that is not oneself, should be of our concern. Furthermore, this pandemic and the climate emergency share a feature: they are global (i.e. they may affect everyone) but they are far from being a great leveller (i.e. they affect us all in a different way), a myth that needs debunking.

The COVID-19 crisis, like the climate and water crises, more or less latent depending on where we live, is at the same time the crisis of the nation-state and a desperate call to articulate supranational solutions; as Francesc Trillas, Senior Lecturer at the Department of Applied Economics of the Universitat Autonoma de Barcelona, puts it: "a greater federalization of resources, legal powers, data, and mindsets".

Though nowadays it may seem countercultural to say so, the collective project of building the European Union is one of the most thrilling political endeavours ever. The European Union is far from being just a common market. It is also a political community characterized by sharing basic political and social values: equality, dignity, peace, solidarity, freedom, and a wide range of social rights recognized for all European citizens.

Last but not least, it is a pressing issue to recognize that these are challenges that demand collective action, through aligning individual interests and collective objectives. In other words, both the current global pandemic and climate emergency demand that personal sovereignty and collective solidarity are reconciled.

Experts on pandemics say that for one to occur, even the most lethal of viruses would have to meet three conditions: be one that humans have not faced before (so that there are no antibodies), that it has the capacity to increase premature mortality rates and that it is easily contagious. Many of those features are common to long-term water insecurity and climate change.

During the influenza A (H1N1 / 09) pandemic, which threatened us all between January 2009 and August 2010, Margaret Chan, former WHO Director-General, stated: "We have a false sense of security." There you go. We definitely need worldwide governments with greater capacity, more intense and effective cooperation, stronger multilateral institutions, and social norms to promote outcome-oriented investment and less consumption in the medium and long term. The path to be taken is not set in stone.

**A slightly different and shorter version of this article was originally published in Spanish on CONAMA (El Congreso Nacional del Medio Ambiente – The Spanish National Environment Congress)'s blog on April 8th, 2020.*

WITH NATURE, N

Beyond human tragedy, COVID-19 poses a reflection on how we relate to each other and to nature. And it leads us to another vision of the problems that beset the human species.

SANTI SERRAT / WE ARE WATER FOUNDATION

The new society that is emerging from the crisis will have to integrate health emergencies into a more global vision with the values of proportionality and cohesion that are characteristic of the culture of the green economy. The path towards the SDGs must consider the fact that a pollution-free and ecologically balanced planet is synonymous with health. On April 3rd, the inhabitants of the city of Jalandhar, 300 kilometers north of New Delhi, experienced something that only the elders remembered: the snowy peaks of the breathtaking Himalayas, more than 200 kilometers away, were visible to the naked eye. The images, which were trending topics on India's social networks, showed the extent to which the air pollution of the city in the state of Punjab had disappeared because of the government-declared confinement just two weeks earlier. The Internet was also filled with other unusual images: deer in the parks of Paris, wild boar herds in Barcelona, dolphins under the transparent waters of Venice, moss and flowers in the cracks in the pavement of the large urban avenues...

The slowing down of human activities has led to a dramatic decrease in pollution levels across the planet. And the withdrawal of humans from urban spaces has shown symptoms of the pressure we are putting on the natural environment. The term "environment" is revealed to us during our confinement with a new meaning:

NOT AGAINST IT

Semi-desert landscape in the Brakna region of Mauritania, where the natives are under pressure from climate change.
© Carlos Garriga / We Are Water Foundation

we are more aware of how we are invading it, how our current way of life is degrading it, and that nature is still alive out there, claiming the habitat that belongs to it and we have usurped.

Zoonosis as a symptom

We're also relearning things we seem to have forgotten. In the 14th century, the bacterium *Yersinia pestis* caused the most devastating pandemic in human history: the Black Death. It affected Eurasia and it is estimated that it took the lives of at least 25 million people; in Europe alone, one third of the population disappeared. At that time, no one knew what a bacterium was, and the disease was popularly attributed to various causes, from divine punishment to the poisoning of well water by the Jews. Few medical texts of the time linked the spread of the disease to rats, specifically to their fleas, the real vector of the pandemic. In the late 19th century, thanks to Louis Pasteur's advances in microbiology, medical science coined a new term: "zoonosis," the transmission of diseases from animals to humans.

Since then, science has recognized several epidemics and pandemics as zoonotic. From the 1918 flu, wrongly called the Spanish flu, which killed some 50 million people to AIDS, Ebola, BSE (mad cow disease), SARS and avian flu. Now, COVID-19, caused by the coronavirus, a microorganism that lived in bats, is causing the greatest health crisis experienced by humanity since the Middle Ages.

Pressure on the environment and climate change

We have therefore known for more than a century that we live in an era of emerging zoonotic diseases. There are millions of different types of bacteria and viruses in animals and plants that can infect

humans. According to a growing body of opinion among epidemiologists and ecologists, over the past few decades we have accelerated the invasion of natural habitats, throwing them off balance and increasing the chances that microorganisms will be transmitted between species and eventually into humans.

This is probably what happened in the Wuhan market, where many virologists believe that an animal infected by bats, perhaps a pangolin, infected the first human. The World Health Organization (WHO) warns that, all around the world, there is illegal trafficking of wild fauna and flora worth between 7 and 23 billion dollars a year, according to estimates by the United Nations Environment Program (UNEP), and this traffic is potentially a global transmitter of microorganisms.

For the vast majority of scientists who study the environment, this intrusion that leads to zoonosis has the same causes and mechanisms that are leading to climate change and environmental degradation. One year before the outbreak of COVID-19, the United Nations *Global Environmental Outlook* report warned of the high probability of the disappearance of half of all habitats and animals on Earth within eight decades. The invasion of these spaces is directly related to the extractive practices that are common in the growth models based on the linear economy that we must now abandon. Some scientists and sociologists, such as Jeremy Rifkin, who has been warning for decades of the catastrophic consequences of climate change on humanity, are more radical in comparing these pandemics with floods, droughts and fires caused by the disruption of the water cycle. What is clear, as pointed out by WHO and the UN Refugee Agency (UNHCR), is that climate change is causing movements of humans and other species, and that animal and human life are moving closer together in space every day; consequently, hosted viruses are increasingly likely to pass from one to the other. Strategies to stop these movements now run parallel to those of health prevention, and this pandemic clearly reveals this. In this regard, in the face of the socio-economic crisis caused by COVID-19, the Secretary-General of the United Nations, António Guterres, pointed out that "if we had made more progress in meeting the Sustainable Development Goals and the Paris Agreement on Climate Change, we would be better prepared to meet this challenge."

Recovery of the water balance in the Kalyandurg region in India, based on small reservoirs, in one of the projects of the We Are Water Foundation. © Javier Biscayar

Floating islands in Lake Titicaca made of cattail leaf where the Uru people live and consume water directly from the lake © Jeison Higuita - Unsplash

The path towards the SDGs must consider that a pollution-free and ecologically balanced planet is synonymous with health

The degradation of land and agricultural resources experienced in many countries affected by climate change is diluting the boundaries of natural habitats out of a need for survival. This is a situation that the We Are Water Foundation has been able to observe in most of the countries where it has developed projects to help restore natural environments. In Nicaragua, India, Bolivia and Peru, the regeneration of land and water through the implementation of ancestral agricultural techniques and education in the access

Indigenous people in Bosawas, Nicaragua, one of the biosphere reserves that must be preserved. © Josiah Townsend

to water, sanitation and hygiene prevents the degradation of the environment and facilitates sustainable growth without the invasion of natural spaces.

Pandemics on the COP agenda

One of the positive consequences we can draw from the terrible human drama of COVID-19 is to place the fight against pandemics, which will continue to threaten humanity in the future, in the same context as environmental recovery. In this sense, measures to recover from the severe economic recession will take into account avoiding health crises as well as environmental ones. However, there is a concern among civil society, companies and institutions, which advocate the attainment of the SDGs, that the lack of economic activity is seen as the only possible way to fight climate change. Some denialist movements use the abrupt halt to pollution, which many celebrate in a somewhat irresponsible way, as synonymous with economic recession and social drama. At the beginning of March, the European Union, at the height of the crisis, published the document "Reflections on Europe's ambitions for climate neutrality in the times of the Covid-19". It specifies the need to achieve environmental goals through a gradual and irreversible reduction in gas emissions with the priority of building a resilient economy and a resilient society, and not through disruptive disturbances such as those caused by the confinement and halting of human activity. Hans Bruyninckx, Executive Director of the European Environment Agency (EEA) has been explicit about this: "Abrupt shocks with an extremely high cost to society are by no means the way the European Union has committed itself to transforming its economy and achieving climate neutrality by 2050." The announced postponement of the Glasgow climate change summit, COP 26, scheduled for November, must not slow down the achievement of the commitments to reduce polluting emissions. The daily isolation experienced by billions of people points to reflections that are not new in the world of water: the revaluation of the concepts of shared natural capital and its collective significance, the reconsideration of essential needs and the values of the circular economy. A pollution-free planet does not mean ruin, but wealth. We are face to face with the end of nature as we have been contemplating it. The challenge is immense, and both our generation and those to come must be prepared for the most important transformation of human awareness in history: with nature, not against it.

WATER AND SANITATION DATA IN THE WORLD: THE SDG 6 TARGETS

The UN SDG 6 Data Portal tracks progress towards this goal using a compilation of country data on a series of indicators

Children collecting water in Kallayanpur slum, one of the urban slums in Dhaka. ©UN Kibae Park

SDG 6 calls for access to water and sanitation for all. There is enough freshwater in our planet, but it is not fairly distributed. This, together with poor water quality and inadequate sanitation, has an impact on water security and livelihoods.

Knowing about water quality, the population that has access to drinking water or sanitation services or the proportion of waste water that is safely treated are some of the indicators used by the UN to track progress towards SDG 6. According to country data compiled and verified by UN agencies responsible over the past few years (2017), we know the following about some of the targets:

★**Drinking water:** 71% of the world's population use a safely managed drinking water service (SDG indicator 6.1.1), defined as an improved source of drinking water that is located on the premises and available when needed, and free of faecal and priority chemical contamination.

★**Sanitation:** 45% of the world's population use a safely managed sanitation system (SDG indicator 6.2.1a), defined as an improved sanitation facility which is not shared with other households and where excreta are safely disposed in situ or transported and treated off-site.

★**Hygiene:** 60% of the world's population have access to a basic handwashing facility (SDG indicator 6.2.1b) with water and soap.

★**Water management:** 49% is the degree of implementation of integrated water resources management (IWRM) at the global level (SDG indicator 6.5.1) based on reporting from 172 countries.

★**Transboundary waters:** 59% of the transboundary basin area has an operational arrangement for water cooperation (SDG indicator 6.5.2).

★**International cooperation:** $8.8 billion is the global amount of water- and sanitation-related official development assistance disbursed in 2017 (SDG indicator 6.a.1).

The UN-Water SDG 6 Data Portal provides regional snapshots for the different indicators, over time and for 2017. Looking at the first two above, Europe and North America, together with Australia and New Zealand, have a high proportion of the population using drinking water and sanitation services.

In Latin America and the Caribbean, the proportion of the population using drinking water services is 74%. For sanitation services, the average is 31%.

Although there is no average figure for the use of drinking water services in northern Africa and western Asia, more than 80% of the population has basic services, whereas for sanitation the average is 38%. In Sub-Saharan Africa the indicators are the lowest: 27 % of the population use drinking water services and 18% use sanitation services.

In central and southern Asia 60% of the people use drinking water services; there are no data on sanitation over time, but 29% of the rural population practiced open defecation in 2017. Meanwhile, in eastern and south-eastern Asia, with no average figure for drinking water services, the proportion of the people with basic and safe services in 2017 was very high. In terms of sanitation, 64% of the people use these services.

NEW FRAMEWORK ON WATER GOVERNANCE FOR PRACTITIONERS

Experts from the Stockholm International Water Institute define the components of water governance and how to put it in practice

What is water governance? SIWI recently tried to answer that question in the article "Unpacking Water Governance: A Framework for Practitioners", in the open access journal *Water*. Despite a growing interest in water governance, there is not enough clarity about the practical meaning of the term or how to work with it. Understanding water governance – *'what it entails'* and *'how to apply it in practice'* – is crucial. Only with a good understanding of the different components of water governance is it possible to improve water resources management and minimize the impact of shocks and stresses.

Water governance experts from SIWI have formulated a framework to offer practical guidance for decision-makers and practitioners on how action-oriented water governance processes can be meaningfully designed. Ultimately, this should lead to improved water governance. In the framework, the term is described through the core components of water governance (functions), what their potential qualities are when performed (attributes), and how they interrelate with the values and aspirations of the different stakeholders to achieve certain outcomes, which ultimately form the structure of the framework.

To assess the existing gaps and improve water governance, one must first understand the governance functions and attributes and how they are interrelated, along with how values and aspirations of individuals shape this process.

Water governance functions are defined as the core activities or processes necessary to develop the sector that are assigned and undertaken by a specific organization (e.g. a ministry or a basin authority). They include policy and strategy, coordination, planning and preparedness, financing, management arrangements, monitoring, evaluation and learning, regulation, and capacity development.

Water governance attributes describe how the governance functions are performed. For example, participation is a key attribute that implies not just mere presence but meaningful and active involvement of a broad spectrum of stakeholders, including vulnerable or marginalized groups in decision making processes. Other attributes are inclusiveness, accountability, transparency, etc.

Adapting the Orders of Outcomes framework proposed by Stephen B. Olsen for the governance of source-to-sea systems, the authors explains four 'orders' that lead to the ultimate long term goal of sustainable forms of development:

★ **First:** Creation of the enabling conditions for a governance initiative.

★ **Second:** Behaviour change of resource users and key institutions.

★ **Third:** Achievement of desired changes in societal and environmental conditions.

★ **Fourth:** A resilient social-ecological system where desired conditions are sustained.

Finally, the quality and extent of implementation of the functions will be shaped by the values and aspirations of the stakeholders in the governance process, including decision-makers and citizens. It involves raising awareness and trying to influence people's behaviour.

THE CARROT FRAMEWORK FOR ACHIEVING A PARADIGM SHIFT IN SANITATION SECURITY AND WATER REUSE

The mobilization during the Millennium Development Goals era led to impressive progress in terms of drinking water but limited success in sanitation. The international community increased its ambition and raised stakes when the governments negotiated and finalized the Sustainable Development Goals.

ENG. PMP HASSAN ABOELNGA, VICE CHAIR OF MIDDLE EAST WATER FORUM MEWF, WATER SECURITY TASK FORCE MEMBER AT IWRA, MANAGEMENT COMMITTEE MEMBER OF SPECIALIST GROUPS AT IWA

DR. OLCAY ÜNVER, VICE-CHAIR OF UN-WATER, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS (FAO)

Five years into the SDGs' implementation, where are the ambitious commitments required to ensure that the 2030 Agenda, including sanitation (SDG 6), will become a reality for everyone across the globe? Fewer than 10 years remain to take urgent action nationally and globally to end open defecation and provide access to sanitation and hygiene for all (SDG 6.2), as well as ensure that all people can live in dignity and see their human rights fulfilled. The big questions are how did we get there, where do billions of people lack access to safely managed sanitation? And what is not working?

Governments have agreed on monitoring this target through indicator SDG 6.2.1a, "Proportion of population using safely managed sanitation services, including a handwashing facility with soap and water", which is more relevant than ever in the current pandemic situation. The current level of materialization towards the sanitation target varies widely across regions, with Sub-Saharan Africa, Latin America, the Caribbean, Northern Africa and Western Asia lagging significantly behind.

A new paradigm is needed that asks the water community to change how we manage and finance water & sanitation to achieve water security

According to UNICEF and WHO, 4.2 billion people do not have safely managed sanitation services, which presents a constant source of stress and illness for those communities. Inadequate sanitation cannot be an option, as it leads to public health problems, poverty, lack of education, lack of opportunity and gender inequality. Globally, 80% of wastewater flows back into the ecosystem without being treated or reused, contributing to a situation where around 1.8 billion people use a source of drinking water contaminated with faeces, putting them at risk of contracting cholera, dysentery, typhoid and polio.

Just like regional and local disparities that do not appear in global numbers, significant differences exist between the rich and the poor across the globe. A UNICEF and WHO report on the inequalities (Progress on household drinking water, sanitation and hygiene 2000-2017: Special focus on inequalities) tell us that in 2017, seven out of ten people who did not have access to even basic sanitation services lived in rural areas and one out of three lived in the Least Developed Countries. Less than one in three countries where open defecation was practiced were on track to achieve near elimination and only one in five to do so for the poorest rural quintile of the population.

We know that underinvestment in both infrastructure and capacity, weak and rigid governance systems, and lack of accountability are among the major reasons for the lack of adequate progress. However, the fact that, in a rapidly changing world, we are still solving new problems with old solutions demonstrates that our experience can be our worst enemy. We are still investing in linear systems, a "big pipes in and big pipes out" transfer model, which aims to protect public health and avoid nuisance impacts using large-scale technological solutions for narrowly defined service problems; we are working in silos; our policies are set without aligning national objectives with the required resources;

Marziaa Bibi, caretaker of the community water pump by VERC, collecting safe, clean drinking water for her family. **©Water.org**

we are still counting on public funds that are insufficient and poorly targeted; the new sources of finance for water and sanitation are constrained by regulatory, institutional and high-risk profiles of many investments; creditworthiness of public utilities is weak; and our ambitious strategies for sanitation are developed with little consideration for how or by whom they will be implemented, nor how they will be financed.

The status quo is no longer enough, and this model will not deliver on the water and sanitation targets by 2030. SDG 6 sets the performance bar higher than the millennium development goal (MDG 7C) by shifting the target from basic sanitation to safely managed sanitation, which makes achieving sanitation security much harder.

A new paradigm is therefore needed that turns this approach on its head and asks the water community to change the way we manage and finance water and sanitation to achieve water security for sustainable development. It is crucial to shift from *ad hoc* and isolated wastewater solutions (such as one treatment plant per municipality) to fully integrated river basin planning approaches, which yield more sustainable and resilient systems. It is not only about money; solving serious sanitation problems requires creativity and innovation to turn risks into opportunities, providing fit for purpose solutions, and changing the financing mechanisms of water, providing strong governmental leadership and accountability, as well as recognizing the role of communities, acknowledging multiple

Actions by governments and the international community are only part of the solution to solve the most serious water challenges

Under an effective policy and regulatory framework, the private sector could play a greater role in cost effective and quality services

knowledge cultures, and accepting the inevitability of uncertainty.

Framework for achieving water security in a challenging climate

Framing the challenges of water security goes beyond single-issue indicators such as water stress, water quality, or access to water and sanitation, to focus more on holistic thinking about community's demands and expectations. There is growing recognition of the role that fragility and conflict can play in aggravating water insecurity; infrastructure may be seriously deteriorated, and institutions may be weakened to the point where service providers are unable to provide basic water services and incapable of managing water related hazards, resulting in riots, migration, and loss of livelihoods.

Achieving water security is like solving a Rubik's cube. When attempting to solve a Rubik's cube most people pick a colour and complete one face of the cube before moving on to the next. While this approach is fun, it is ultimately doomed to fail, because addressing the needs of one side of the cube causes the remaining five to be thrown into chaos. The same goes for solving the challenges of water security.

To achieve urban water security and sustainable water management, we need collective actions to implement the integrated framework of DECS (drinking water and human beings (D), ecosystems (E), climate change and water-related hazards (C), and socio-economic factors (S)). More is needed to enhance the role of the private sector and civil society. Actions by governments and the international community are only part of the solution to solve the most serious water challenges. Under an effective policy and regulatory framework, the private sector could play a greater role in supplying cost effective and quality water services, as well as in harnessing and developing new technologies that enhance water security. Civil society, academia, and the media also have important contributions to make. Much greater public information is needed to educate people about the availability of water resources and the costs and consequences of water use and practices.

Coherence and Capacity Development

Policy coherence is an important tool towards 'transformative sanitation development' and to incentivize the transition from the very clunky centralised setups into decentralised systems with a circular economy approach. The lack of supportive and coherent legal and institutional frameworks for water reuse is a major barrier, preventing a wider practice in many countries beyond pilot schemes. Water and sanitation are typically treated as two separate systems, while they are both integral parts of one system: the water cycle. This means breaking out of institutional and policy silos to fully realise the benefits of synergistic actions, iden-

Woman in field Africa

tifying unintended negative consequences of policies, and effectively managing unavoidable trade-offs. SDG 6 takes into account the components of the water cycle but does not provide explicit policy or operational guidance on how to ensure an integrated and coherent implementation of the sanitation target as part of the whole water cycle or across the broad suite of SDGs.

As many utilities lack technical or financial capacity for sanitation planning, capacity development for staff including *sanitation workers*, institutions and people are critical components of implementing the sanitation and WASH policies, strategies, and programs.

Water and sanitation are typically treated as two separate systems, while they are both integral parts of one system: the water cycle

New toilet in the rural village of Mullapara. Mullapara Village, Singair Upazila, Bangladesh. **©Rich Thorsten/Water.org**

Women going to wash clothes, Africa

Adaptive Solutions

There is no one-size-fits-all approach to sanitation services. Adaptive solutions of technical, policy measures and technology are critical for bridging the sanitation gap. Fit for purpose sanitation systems are based mainly on the purpose and nature of the system, whether onsite sanitation, centralised, decentralised or hybrid sanitation systems or a non-sewer system.

Regulations and Institutional Framework

Access to safely managed sanitation for all may continue to be unattainable for low income countries for many years, which calls for governments to introduce policies that are conducive to new solutions. In the absence of a regulatory framework, wastewater is often used illegally and improperly in agriculture.

A legal framework for reuse should define clear and precise consent procedures, standards, and responsibilities, together with enforcement mechanisms. It should also address the competent institution's responsibilities. In many countries, the laws and regulations governing water reuse are not detailed enough about reusing treated wastewater. Sectoral water legislation is often outdated. Even where adequate legislation is in place, monitoring and enforcement have proved to be a major barrier.

Raising Awareness and cross sector collaboration

Community engagement and cross sector collaboration are essential to achieve sanitation security. Wastewater reuse suffers from perception, cultural and religious barriers in many countries. Concerns in many countries in the MENA region regarding the rules of the faith or "fatwa" – an authoritative religious ruling – are a major impediment in wastewater reuse.

A legal framework for reuse should define clear consent procedures, standards, and responsibilities, together with enforcement

Woman collecting water from a hand pump. Site visit to potential partner ORDA. Achefar, Ethiopia.
© Heather Arney / Water.org

Opportunities

Changing the paradigm from risks to opportunities in sanitation relies on changing our mindset toward wastewater. Developing countries often discharge wastewater into watercourses as they lack the financial means and knowledge of technology that would lead to the economic benefits of having proper sanitation system and wastewater reuse. Wastewater is not something we should discharge into the environment and get rid of; we really have to change our perceptions and look at wastewater as a precious resource. Wastewater can help us meet the water demand, it has the neces-

Water falling

sary nutrients for fertilizers for food production, it has organic material that can be used for energy production to support energy security.

Technology and innovations

Many countries cannot afford expensive, complex solutions to operate wastewater treatment processes and should use appropriate technologies. These mean simple processes of proven technology, of low investment and O&M costs, simple to operate and with the capacity to yield any required quality.

The United Nations family has been underlining (WWDR 2017) "the importance of managing wastewater as an undervalued and sustainable source of water, energy, nutrients and other recoverable by-products, rather than something to be disposed of or a nuisance to be ignored". The post-COVID era appears to be one that will be conducive to innovations, capacity development and solutions that can synergize with nature and are circular. Let us make it a reality!

The post-COVID era may lead to innovations, capacity development and solutions that can synergize with nature and are circular

DR TEDROS ADHANOM GHEBREYESUS

DIRECTOR GENERAL OF THE WORLD HEALTH ORGANIZATION (WHO)

Elected as Director-General by WHO Member States in May 2017, we have seen Dr Tedros Adhanom Ghebreyesus countless times in the news as he leads the World Health Organization through the COVID-19 public health emergency.

The first person from the WHO African Region to serve as WHO's chief technical and administrative officer, he served formerly as Ethiopia's Minister of Foreign Affairs from 2012-16 and as Minister of Health from 2005-2012. Dr Tedros is globally recognised as a health scholar, researcher, and diplomat with first-hand experience in research, operations, and leadership in emergency responses to epidemics.

"I believe the global commitment to sustainable development – enshrined in the Sustainable Development Goals – offers a unique opportunity to address the social, economic and political determinants of health and improve the health and wellbeing of people everywhere".

The WHO has been continuously monitoring and responding to the novel coronavirus outbreak, working 24/7 to analyse data, provide advice, coordinate with partners, help countries prepare, increase supplies and manage expert networks.

As we navigate this difficult time, Dr Tedros has recently stressed the WHO's "commitment to science, solutions, and solidarity".

CLIMATE CHANGE

LONG TERM RESPONS
AN OPPORTUNITY TO T
SUSTAINABLE

The current coronavirus pandemic is affecting people and societies across the world, and it's quite clear that it will have a long term impact on the global economy. While the urgent thing now is to address the immediate consequences, recovery investments can move away from business as usual and lay the foundation for a green, circular economy. As Christiana Figueres, former head of UN Climate Change and an architect of the Paris Agreement, commented,"We have a massive crisis = opportunity on our hands. We cannot afford to waste it. Recovery must be green."

We are witnessing an unprecedented release of funds, and extraordinary collaboration efforts at the global level. It's time to reflect on risk and resilience. Victoria Crawford, Environmental Resilience Project Lead at the World Economic Forum has outlined these and other changes brought on by the pandemic that can help us seize this moment and rebuild our society and economy to be more sustainable. She writes: "If the pandemic teaches us to acknowledge our vulnerability to high-impact shocks such as pandemics and climate-related disasters, we will be infinitely better placed to prepare for them."

The energy sector is in the line of fire as usual when there's talk about climate change and decarbonising the economy, with calls for economic relief that contemplates phasing out fossil fuels. But other sectors need a closer look. As the authors of the UN World Water Development Report (WWDR) released on March 22nd noted, while the need to combat climate change through better management of the water cycle is well recognized, it is not being translated into reality. Meanwhile, water is the medium through which climate change will affect societies and the environment the most, noted Richard Connor, Editor in Chief of the report.

We need to prioritise water: the water sector is a key one to ensure resilience to global threats. The 2020 WWDR highlights the links between water and cli-

The positive side of the COVID-19 emergency is the response shows societies are capable of transforming themselves almost overnight

Governments across the world are taking measur substantial economic relief packages. This crisis sustainability and

CRISTINA

ES TO THE PANDEMIC: RANSITION TO A MORE E ECONOMY?

es to deal with the COVID-19 pandemic, including provides opportunities to design responses with resilience in mind.

Novo Pérez

mate change. Furthermore, the link between water and health has always been clear, but the current coronavirus crisis has brought it to light: 40% of humanity cannot wash their hands to prevent the spread of disease.

The many connections between the health of our planet and human health have long been known. The current pandemic has put the spotlight on one of them: the key role the planet health plays in the spread of zoonotic diseases (those originating in pathogens that transfer from animals to humans). "The wild must be kept wild", in words from UNEP's head Inger Andersen. The expansion of human activity has squeezed nature into a small corner of the globe, putting it under increasing stress. Human encroaching into natural habitats — through urbanisation, habitat loss and fragmentation, and wildlife trade — increases interactions between animal hosts and humans, Ms Andersen notes. Furthermore, as the climate continues to change, changes in temperature, humidity and seasonality have an effect on the survival of microorganisms in the environment. In fact, the UNEP outlines 5 factors that are leading to an increase in zoonotic diseases: land use changes such as deforestation, intensive farming, wildlife trade, antimicrobial resistance, and climate change.

The positive side of the COVID-19 emergency is that the response shows that societies are capable of transforming themselves almost overnight. The world's richer inhabitants have shown they are able to slow down consumption, with less non-essential shopping and less travel. These are the same types of changes necessary to address climate change. "We have a responsibility to recover better" than after the 2008 financial crisis, UN Secretary-General Antonio Guterres said, adding that "we have a framework for action – the 2030 Agenda for Sustainable Development and the Paris Agreement on Climate Change. We must keep our promises for people and planet."

The water sector is a key one to ensure resilience to global threats: The 2020 WWDR highlights the links between water and climate change

Teresa Hartmann
Project Lead, Climate Initiatives, World Economic Forum

"Climate readiness is the next big frontier for business to remain competitive"

We interviewed Teresa Hartmann, Project Lead for Climate Initiatives at the World Economic Forum, on the opportunities emerging in the aftermath of the pandemic.

The World Economic Forum (WEF), a Geneva-based nonprofit, has been fostering public-private cooperation since its creation in 1971. The WEF engages the foremost political, business, cultural and other leaders of society to shape global, regional and industry agendas. Always at the forefront of global issues, currently it provides strategic insight on the impact of the COVID-19 pandemic and governments' responses to it.

Green stimulus packages in response to the pandemic offer an opportunity to shape policies in line with climate action. While this may not happen immediately, what do you think are the prospects of governments seizing this opportunity?
The COVID pandemic has exposed the fragility of our current economic, social and health systems. Forward-looking governments have recognized the importance of designing stimulus plans with long-term resilience in mind.

At the same time, governments are under enormous pressure to pass recovery packages swiftly to restart the economy. The important thing is to ensure we do not create an unintended rebound effect where greenhouse gas emissions and pollution surge as a result of short-term growth.

"INVESTING IN A CLEAN ENVIRONMENT AND RESILIENT INFRASTRUCTURE TODAY IS ALSO AN INVESTMENT IN PUBLIC HEALTH AND DYNAMIC ECONOMIES"

In the EU, 13 climate and environment ministers called for a Green Deal to be an integral part of the recovery package. At the same time, however, we are seeing environmental regulation being suspended in the name of economic recovery, for example in the US.

Environmental resilience and human health are intrinsically linked. Air pollution contributes to respiratory disease, shifting climatic zones accelerate the propagation of tropical diseases like malaria and floods carry infectious diseases like typhoid and cholera.

What we are experiencing now is that pandemics can have a devastating impact on the economy. Investing in a clean transition has the potential to reverse these adverse economic effects while safeguarding nature and human health. Fighting climate change, investing in a clean environment and resilient infrastructure today, is also an investment in public health and dynamic economies further down the road.

What do you think businesses can learn from the coronavirus crisis in terms of risk, resilience, and diversification to climate-proof themselves?
Similar to what we are seeing today, many of the climate-related crises that are yet to come have the potential to disrupt global value chains, decrease food security and threaten traditional business models.

During the pandemic, we are seeing companies that invested heavily in talent, digital transformation or customer relations are proving more agile in responding to the current situation. As climate risks increase, the ability to respond to natural disasters, supply chain disruption and shifts in agricultural production is becoming more business-critical.

In both cases, crisis preparedness requires long-term investments and a stakeholder focus rather than short-term profit maximization.

Businesses across different sectors have been integrating green transition and digital transformation in the past years. Do you think these trends will accelerate in the aftermath of the pandemic, and will they help with climate readiness?
Climate readiness is the next big frontier for business to remain competitive. The world needs to prepare for more frequent natural disasters, droughts, wildfires and desertification. The ability to reduce water and energy consumption, shore up infrastructure and diversify production will determine the survival of many industries.

While the case for climate readiness is clear in the medium to long term, businesses are faced with an immediate crisis that is bound to focus resources on the current economic viability of their companies.

Governments have increasingly been incentivizing clean energy, pricing greenhouse gas emissions and pollution. The question is whether we can rely on policymakers to continue these measures rather than backslide in the face of an economic downturn.

The risk of a global pandemic was known for years, yet we did not pay attention to it and are now realising the costs of such unpreparedness. Experts have made us well aware of the risks of climate change for years too. Do you think there will be a new attitude to risk that leads to heightened climate action from now on?

The human tragedy and economic downturn of the pandemic have cast a light on the stark inequalities in our society. Climate change is set to exacerbate the human hardship, economic inequality and global health crises. Fighting climate change seems like an obvious choice when it is a way to ensure healthy societies and economic prosperity.

However, the risks associated with climate change are often indirect and difficult to grasp or directly attribute to one country, business or individual action.

That's what makes the psychology of climate action so complex. We need to become better at speaking a clear language. Climate change means hunger crises, a lack of clean water, mass migration and war.

We were seeing mass movements like Fridays for Future, calling for climate action before the pandemic. It remains to be seen whether these trends persist in a post-COVID economy.

We need to continue to lend a voice to youth, progressive businesses and governments. Otherwise climate action risks getting lost in the public discourse amidst fears of a recession and the second wave of the pandemic.

International platforms like the World Economic Forum and the United Nations have a crucial role to play in driving action, as do media outlets in keeping the discourse alive and citizens in holding their governments to account.

The authors of the UN World Water Development Report, released on March 22nd noted that, while the need to combat climate change through better management of the water cycle is well recognized, it is not being translated into reality. Do you think there is momentum in the calls for a green recovery from the pandemic to increase the role of the water sector as a key one to ensure resilience to global threats?

Water availability is one of the most critical issues to ensure food security and improve human health. This is one of the tangible issues in the context of climate change that has the potential to improve the lives of millions.

While the transmission of COVID-19 was not linked to clean water, other epidemics like Ebola are. As global pandemics are becoming more frequent and climate change is outpacing us, it is imperative to improve water management.

The current momentum on the public health debate certainly enables increased investments in the sector. The water cycle is also an important feedback loop with the potential to further exacerbate climate change. Looking at environmental triggers, we could see an 8% reduction of rainfall in the Amazon by 2050, turning the world's lungs into a savannah.

"COMPANIES THAT INVESTED IN TALENT, DIGITAL TRANSFORMATION OR CUSTOMER RELATIONS ARE PROVING MORE AGILE IN THE CURRENT SITUATION"

There are successful initiatives like the 2030 water resources group that address water storage, wastewater treatment, freshwater abstraction. Governments will need to increase resources to scale and amplify these efforts.

Our societies are showing their ability to adapt to the new circumstances imposed by the pandemic. What do you think could be done to reinforce the idea that, the same as we have been able to successfully re-arrange our lives to practice social distancing, positive change to achieve climate action objectives is possible?

We are all experiencing firsthand how a radical lifestyle change can clear up polluted skies, bring back wildlife to cities and reduce traffic to almost zero. This is triggering a discussion on how to design livable cities, low-carbon economies and shared transport systems in a post-COVID world.

As our movements have become constrained, we are valuing our communities and personal relationships more, taking time to reflect on our priorities and are returning to a much simpler life with shorter distances and an externally imposed material minimalism.

"AS GLOBAL PANDEMICS ARE BECOMING MORE FREQUENT AND CLIMATE CHANGE IS OUTPACING US, IT IS IMPERATIVE TO IMPROVE WATER MANAGEMENT"

During the lockdown, we've seen the emergence of shorter value chains, for example an increased uptake of local vegetable production and a natural tendency towards circular models, where communities are sharing, swapping or reusing equipment.

In times of reduced or slower international trade, strengthening local and regional value chains can improve economic and environmental resilience at the same time.

I would hope that this sentiment of social solidarity, the sharing economy and appreciation for "less is more" can persist beyond the pandemic.

NOT ACHIEVING PARIS CLIMATE GOALS COULD COST THE GLOBAL ECONOMY $600 TRILLION

Recent research finds a global gain of $336 trillion if countries take action to keep temperature rise to 2 degrees Celsius

A new study has quantified the cost to the global economy of not achieving the commitments made in the Paris climate agreement in some $600 trillion this century.

The latest estimations by the Intergovernmental Panel on Climate Change show that global temperatures are very likely to reach 1.5 degrees Celsius of warming between 2030 and 2052.

In approximately 80 years' time, our current path could imply our planet could warm up be 3-4 degrees Celsius, which would lead to millions of deaths.

Countries committed in the 2015 agreement to reduce their greenhouse gas emissions to limit the increase in global temperature this century well below 2 degrees Celsius above pre-industrial levels, and to pursue efforts to further limit it to 1.5 degrees Celsius. Parties to the Paris Agreement put forward their efforts through "nationally determined contributions" (NDCs), their individual emissions reduction plans, and report regularly on their emissions and on their implementation efforts.

Currently the Earth is experiencing the effects of global warming in the form of heat waves, drought, wildfires and storm surges worsened by sea level rise, just with a 1 degree Celsius of warming.

To achieve the 1.5 degree Celsius target, global emissions should fall by over 7% per year until 2030, but given current NDCs the planet is likely to heat somewhere between 3 and 4 degrees Celsius above the historic baseline by the end of this century.

To date, few studies have estimated the potential net economic gain of taking action. In this new study, published in Nature Communications, experts consider different scenarios to calculate the net benefit to the global economy under different plans, considering the cost of low-carbon technology, of climate damage, and the notion that countries would pay a "fair share".

Their findings show a global gain of $336 trillion if countries take action to keep temperature rise to 2 degrees Celsius, and $422 trillion if the temperature rise is limited to 1.5 degrees Celsius.

However, the global loss if the Paris temperature targets are not met can be as much as $600 trillion by 2100 ($126-616 trillion), an average 0.57 per cent of national annual GDP until that date.

Furthermore, the authors looked into the cost of not even achieving the commitments in current NDCs, which ranged from $150 trillion to $790 trillion. Because short-term economic gain has always come before climate action, countries miss out on the important cost benefits of acting early, said lead author Biying Yu. The estimated upfront investment in climate action necessary to reach a break-even point between mitigation costs and benefits globally would be $18-113 trillion, most of it (90%) from G20 countries. "If countries are well aware of the huge losses they will suffer if they don't reduce emissions... will they be more rational in making choices that will protect them, thereby boosting their response to climate change and driving the global climate governance process?" questioned Yu.

UN WORLD WATER DEVELOPMENT REPORT 2020: WATER RESOURCES PART OF THE SOLUTION TO CLIMATE CHANGE

The report released by the United Nation calls for more efforts to tackle rising water stress

Climate change will affect the availability, quality and quantity of water needed for basic human needs, thus undermining enjoyment of the basic rights to safe drinking water and sanitation for billions of people, warns the latest UN World Water Development Report. Such a deterioration of the situation would only hinder achievement of Sustainable Development Goal 6 which is part of the 2030 Agenda for Sustainable Development, according to which access to safe drinking water and sanitation must be guaranteed for all within ten years. This will be a considerable challenge – 2.2 billion people currently do not have access to safely managed drinking water, and 4.2 billion, or 55% of the world's population, are without safely managed sanitation.

Water use has increased sixfold over the past century and is rising by about 1% a year. However, it is estimated that climate change, along with the increasing frequency and intensity of extreme events – storms, floods and droughts, will aggravate the situation in countries already currently experiencing 'water stress' and generate similar problems in areas that have not been severely affected. Furthermore, the report highlights the fact that poor water management tends to exacerbate the impacts of climate change, not only on water resources but on society as a whole.

The Director-General of UNESCO, Audrey Azoulay, stresses "that water does not need to be a problem – it can be part of the solution. Water can support efforts to both mitigate and adapt to climate change."

The Chair of UN-Water, and President of the International Fund for Agricultural Development (IFAD), Gilbert F. Houngbo, says: "If we are serious about limiting global temperature increases to below 2°C and achieving the Sustainable Development Goals by 2030, we must act immediately. There are solutions for managing water and climate in a more coordinated manner and every sector of society has a role to play. We simply cannot afford to wait."

Indeed, water quality will be affected by increased water temperatures and a decrease in dissolved oxygen, leading to a reduction in the self-purification capacity of freshwater basins. We will see increased risks of water pollution and pathogen contamination caused by floods or higher concentrations of pollutants during periods of drought.

Many ecosystems, particularly forests and wetlands, are also under threat, reducing biodiversity. Water supplies will be affected, not only for agriculture – which accounts for 69% of freshwater withdrawals – but also for industry, energy production and even fisheries.

Much of the impact of climate change on water resources will be manifested in the tropics, where most developing countries are located, with potentially apocalyptic consequences for small island states, some of which could be wiped off the map. Mountainous areas are also exceptionally vulnerable through impacts on mountain glaciers and snowcaps, which show a decreasing trend almost everywhere in the world.

CEO WATER MANDATE LAUNCH WATER RESILIENCE COALITION

Coalition members will commit to provide leadership and advocacy in the field of water resilience

The Water Resilience Coalition brings together some of the biggest companies in the world to help preserve the world's freshwater resources. Led by the CEO Water Mandate, an initiative of the UN's Global Compact, coalition members will commit to having a positive impact in water stressed basins, to develop and implement resilient practices across their industry, and to provide leadership and advocacy in the field of water resilience.

Gilbert F. Houngbo, Chair of UN-Water and President, International Fund for Agricultural Development said establishing the coalition was the first step in understanding that collective action in water resilience was vital. "Successfully addressing the water crisis and climate change will require all companies, including large corporations, to realign their business models, products and practices in ways that decouple production and consumption from the depletion of water resources," he said.

Water.org president Jennifer Tisdel Schorsch, said bringing together industry and civil society organizations would help ensure that the needs of those living without access to safe water and sanitation were met. "The water crises can only be solved with our collective commitment and expertise," she said. "Access to water connects every aspect of life, turning problems into potential – contributing to improved health for families around the world, empowering people with time for school and work, and helping to build robust economies."

CLIMATE CHANGE COULD CAUSE SUDDEN BIODIVERSITY LOSSES WORLDWIDE

World's warming could cause catastrophic losses of biodiversity across the globe throughout the 21st century

A warming global climate could cause sudden, potentially catastrophic losses of biodiversity in regions across the globe throughout the 21st century, finds a new UCL-led study.

The findings predict when and where there could be severe ecological disruption in the coming decades, and suggests that the first waves could already be happening.

The study's lead author, Dr Alex Pigot (UCL Centre for Biodiversity & Environment Research): "We found that climate change risks to biodiversity don't increase gradually. Instead, as the climate warms, within a certain area most species will be able to cope for a while, before crossing a temperature threshold, when a large proportion of the species will suddenly face conditions they've never experienced before."

The researchers found that in most ecological communities across the globe, a large proportion of the organisms will find themselves outside of their niche (comfort zone) within the same decade. Across all of the communities, on average 73% of the species facing unprecedented temperatures before 2100 will cross that threshold simultaneously.

The researchers predict that if global temperatures rise by 4°C by 2100, under a "high emissions" scenario which the researchers say is plausible, at least 15% of communities across the globe, and potentially many more, will undergo an abrupt exposure event where more than one in five of their constituent species crosses the threshold beyond their niche limit within the same decade.

CLIMATE-DRIVEN MEGADROUGHT IS EMERGING IN WESTERN U.S., SAYS STUDY

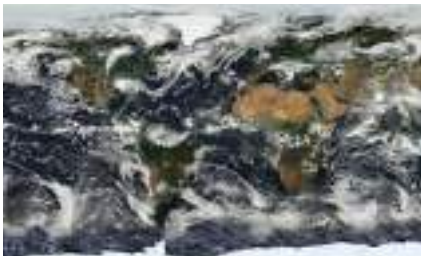
The American West may be entering into a "megadrought" worse than any in the historical record

With the western United States and northern Mexico suffering an ever-lengthening string of dry years starting in 2000, scientists have been warning for some time that climate change may be pushing the region toward an extreme long-term drought worse than any in recorded history. A new study says the time has arrived: a megadrought as bad or worse than anything even from known prehistory is very likely in progress, and warming climate is playing a key role. The study is based on modern weather observations, 1,200 years of tree-ring data and dozens of climate models,

"Earlier studies were largely model projections of the future," said lead author Park Williams, a bioclimatologist at Columbia University's Lamont-Doherty Earth Observatory. "We now have enough observations of current drought and tree-ring records of past drought to say that we're on the same trajectory as the worst prehistoric droughts."

The researchers say that rising temperatures are responsible for about half the pace and severity of the current drought. If this overall warming were subtracted from the equation, the current drought would rank as the 11th worst detected — bad, but nowhere near what it has developed into. Angeline Pendergrass, a staff scientist at the U.S. National Center for Atmospheric Research, said that she thinks it is too early to say whether the region is at the cusp of a true megadrought, because the study confirms that natural weather swings are still playing a strong role.

WMO IS CONCERNED ABOUT IMPACT OF COVID-19 ON OBSERVING SYSTEM



WMO is working with its Members to mitigate the impact as much as possible

The World Meteorological Organization (WMO) is concerned about the impact of the COVID-19 pandemic on the quantity and quality of weather observations and forecasts, as well as atmospheric and climate monitoring.

WMO's Global Observing System serves as a backbone for all weather and climate services and products provided by the 193 WMO Member states and territories to their citizens. It provides observations on the state of the atmosphere and ocean surface from land-, marine- and space-based instruments. This data is used for the preparation of weather analyses, forecasts, advisories and warnings.

"National Meteorological and Hydrological Services continue to perform their essential 24/7 functions despite the severe challenges posed by the Coronavirus pandemic," said WMO Secretary-General Petteri Taalas. "The impacts of climate change and growing amount of weather-related disasters continue. The COVID-19 pandemic poses an additional challenge, and may exacerbate multi-hazard risks at a single country level. Therefore it is essential that governments pay attention to their national early warning and weather observing capacities despite the COVID-19 crisis," said Mr Taalas.

Some parts of the observing system are already affected. Most notably the significant decrease in air traffic has had a clear impact. In-flight measurements of ambient temperature and wind speed and direction are a very important source of information for both weather prediction and climate monitoring.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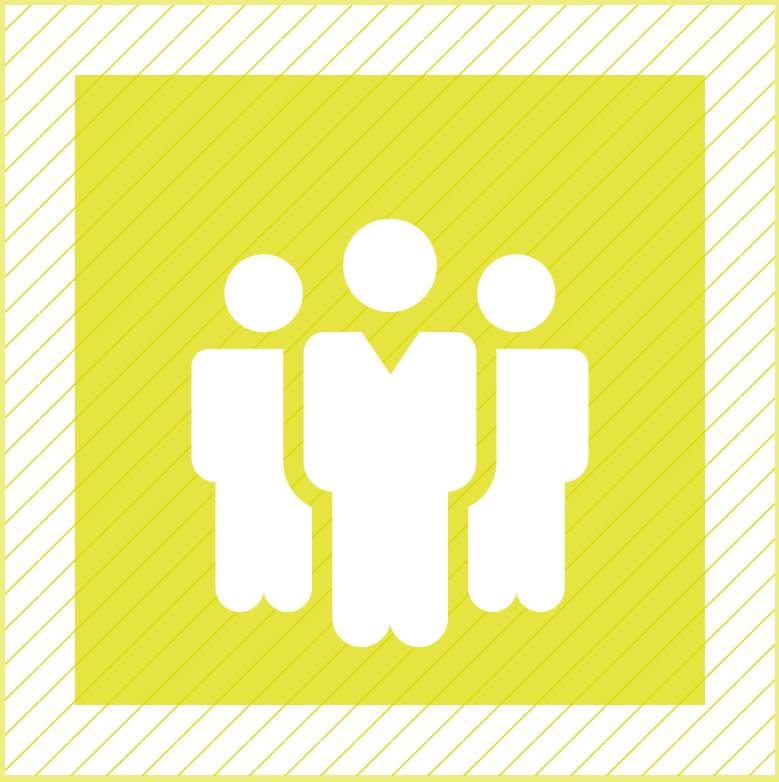

BUSINESS

WATER REUSE AS A SOLUTION FOR AGRICULTURAL IRRIGATION

We all know that agriculture accounts for approximately 70% of the water consumed in the world, followed by industry and household use. Large amounts of water are needed to produce food, which is later consumed by millions of people around the planet.

Water reuse or reclaimed water, provided it is treated and used safely, has become a reliable alternative to conventional water resources for a number of uses, such as agriculture and industry.

For this reason, on 7 April, the European Union announced a new regulation that will facilitate the use of treated urban wastewater for agricultural irrigation, thus reducing the scarcity of water for crop irrigation and helping Europe to adapt to the consequences of climate change. The regulation, which is fully in line with the circular economy, will improve the availability of water and encourage its efficient use.

The European Council has made a much-needed decision, especially for the Mediterranean countries, which are more exposed to long periods of drought. The regulation must now be approved by the European Parliament at second reading before it can be published in the Official Journal of the EU, but it is a big step forward in regulating the technology of reuse, which has still not been widely adopted.

Water stress and climate change are two of the main drivers of water reuse and efficiency. Increased reuse of treated wastewater for agricultural purposes would decrease the extraction of surface and groundwater bodies, reducing the impact of treated wastewater discharges on the bodies of water, promoting water savings and ensuring a high level of environmental protection.

The European Union announced a regulation that will facilitate the use of treated urban wastewater for agricultural irrigation

However, the main challenge is still how to increase the percentage of water reuse, with safe treatments that eliminate the risks to human health and the environment, related to microbial and emerging contaminants in reclaimed water. But technologically, this is possible today, and countries like Spain and Portugal are pioneers in safe water treatment for agricultural and forestry uses. In addition, monitoring the quality of water at the different stages of the wastewater treatment process ensures that it is safe to reuse for different purposes.

The reuse of water for agricultural irrigation also contributes to the promotion of the circular economy, as nutrients can be recovered from reclaimed water and applied to crops using fertilization techniques. This means that the reuse of water could potentially reduce the need for supplementary applications of mineral fertilizers.

In order to increase confidence in water reuse and to gain an understanding of its benefits, it is essential to make clear, complete and up-to-date information available to the public to allow for greater transparency and consequently increase acceptance. Both utilities as well as interested companies must ensure that information and awareness campaigns are adapted to the scale of water reuse and their final audiences. Without education and awareness, it is difficult to implement new previously-unused technologies.

One success story is that of Singapore's National Water Agency, which has developed a new concept called NEWater to define a new non-conventional water source through reuse. Today, 40% of Singapore's water demand is met with reused water, and this figure is expected to increase to 50% by 2030. Because of

this, Singapore is internationally recognized as a model city for integrated water management and a leading center for business opportunities and expertise in water technologies.

According to the Spanish Association of Desalination and Reuse (AEDyR), "Spain is the European leader in water reuse, given that it is the country that produces the greatest volume of reused water, and it is fifth in the world in terms of installed reuse capacity". "Valencia is the region that reuses the greatest volume of water, and Murcia is the one that reuses the highest percentage, reaching 90% of treated wastewater. Together, both regions produce more than half of the reclaimed water used for irrigation throughout Spain, which is the main application of this resource".

But Europe still has a long way to go. According to the *Water Reuse Europe* association, in 2018, only 2% of treated wastewater was reused in Europe, although this is expected to increase in the near future, with Portugal and Spain presenting the greatest potential. This is partly due to the lack of regulation and common environmental and health standards in Europe up to this point.

This new European regulation will undoubtedly lead to increase the use of reuse technologies, thus helping to combat water stress and scarcity. Ensuring that enough water is available for irrigation of fields, particularly during heatwaves and severe droughts, can help prevent crop shortfall and food shortages.

Increased reuse of treated wastewater for agricultural purposes would decrease the extraction of surface and groundwater bodies

COVID-19: CARIBBEAN AND GL

The COVID-19 pandemic has currently spread to most countries in the world. A webinar for water professionals in the utility sector has looked at the how the Caribbean region is dealing with this unprecedented situation.

CRISTINA NOVO PÉREZ

On Monday May 4th, Miya Water, a world leader in water management efficiency, in partnership with the Caribbean Water and Wastewater Association (CWWA), organised a webinar to discuss how the Caribbean countries, and particularly the water industry, are weathering the challenges of COVID-19. The webinar, directed towards water and wastewater personnel operating in the utility sector, was followed live by more than 140 people and had more than 1,760 views on You Tube in less than 24 hours, with more than 4 million impressions on Twitter.

Although water company staff are considered essential workers in most countries, in some of them, like the Philippines, they are not

Wayne Williams, Executive Director of the CWWA and moderator for the event, introduced the webinar from Trinidad and Tobago. He remarked that even though the current pandemic has shifted many paradigms and there are many downsides, thanks to our resilience, we are beginning to see some new upsides developing as we adapt. Before introducing the first speaker, Mr Williams told the audience they could leave their questions for the Q&A session of the webinar via Twitter or Sli.do using the hashtag #COVID19CaribbeanWater, or directly on the YouTube chat.

Stuart Hamilton, Chair of the IWA's Water Loss Specialist Group (WLSG), was the first presenter, addressing the audience from the United Kingdom. He outlined how the world is working in the non-revenue water (NRW) arena, and also described how water companies in several countries are coping with the pandemic, namely the UK, Portugal, Australia, China, Philippines, Saudi Arabia, Greece and Malaysia. Although water company staff are considered essential workers in most countries, in some of them, like the Philippines and Malaysia, they are not, so repairs in the field have to wait until the lock down is over. Water companies can expect decreased revenues, but that should not mean rehabilitation programmes are to stop, forcing an intermittent supply regime: "We have to go forward because we can make the company vulnerable to the next COVID, to the next pandemic". "We prepare ourselves through NWR reduction and all the other elements within the water company", he noted, saying this is a worldwide issue. He then proposed thinking outside the box to search for solutions.

The next participant was Noam Komy, Chief Growth Officer of Miya Water, speaking on efficiency as a key component in resiliency. He started on a posi-

LOBAL IMPACT AND RESPONSE

tive note, reflecting on how throughout history pandemics have generated a huge change towards better water and sanitation in cities like London or Paris. Mr Komy observed that Caribbean utilities are generally stressed financially and operationally and struggle to supply quality service that is essential to combat pandemics. He remarked: "This is a time we can show to our governments, to our stakeholders, including our clients, how important is a water system". Water utilities are one of the most resilient sectors to disasters, specifically pandemics, and he emphasised the importance of reliance on local staff, training and knowledge transfer. He also expressed hope that the experience with the pandemic will help move forward digitalization, technology and remote operations. He encouraged the reduction of NRW as a basis for efficiency. Proposed principles to modernising a water system are outsourcing the commercial department; private sector financing, and modernising the meter fleet.

Miya Water, in partnership with CWWA, organised a webinar to discuss how the Caribbean countries are weathering the challenges of COVID-19

Afterwards, Christopher Husbands, General manager of Grenada's National Water and Sewerage Authority (NAWASA) and President of the Caribbean Water and Sewerage Association (CAWASA) presented a Caribbean perspective on water and wastewater. He began outlining the current status in the CARICOM, where Heads of Government have agreed on a collective approach to IFIs in accessing assistance to meet financial fiscal challenges arising from the crisis, while Member governments have announced fiscal stimulus packages to help cushion the effects of COVID-19 on individuals, but their ability to assist is limited. In a region where tourism accounts for up to 90% of the GDP in some islands, all hotels are closed. Mr Husbands outlined different effects of the pandemic on water utilities. Even as the region faces the pandemic, it continues to deal with the usual challenges, the first one being the dry season, with reduced water availability due to long term drought, and the second one being the hurricane season, with above-normal hurricane activity predicted for the 2020 season. "From a water utility standpoint, this is something we have to try our best to plan for and reduce the impact of". Looking ahead, he noted, this is not business as usual, with economic implications for the region with the pandemic. Finally, he emphasised the importance of training and technologies to improve operational efficiencies, and the need to redouble efforts on preparedness and response.

It was then the turn for Wayne Williams's own talk on Caribbean utilities, COVID-19 impact and responses. He presented the CWWA's mission and vision, aims and objectives. While CAWASA is an association of utilities, CWWA is an association of professionals and practitioners. Both associations work together in the Caribbean region to promote the water, wastewater and waste sectors. His underlying message is that their services are essential and exempt from quarantine, while the demand for improved health and safety practices and procedures has increased. He noted that, while COVID-19 is a disaster, in the Caribbean there are environmental emergencies which look almost the same. He then described the impact on private contractors and governments which will

BOT and PPP financing models have been tabled as potential solutions to build new infrastructure or improve existing one

see lower revenues, that will be directed to priority areas, which do not necessarily include the water and waste sectors. Mr Williams restated something other speakers also mentioned: "improving operational efficiencies becomes paramount".

Next, Aranzazu Mencia Saeta, VP Business Development for Almar Water Solutions talked about BOT, PPP projects worldwide and how they are being affected by COVID-19. Looking into the future, BOT and PPP financing models have been tabled as potential solutions to build new infrastructure or improve existing one, being as it is that water is and will always be a critical sector, which has to be in good shape to overcome this pandemic or anything else that may come in the future, explained Ms Mencia. She outlined the different types of contracting models. A first factor driving the increase in PPP projects is population growth, demanding quality water and waste water services, together with public players seeking financial alternatives. The new players coming in are private companies, who offer extensive know-how, innovation and efficiency, and risk management, and the financial sector. Ms Mencia talked about key factors for the success of a PPP. Concerning the consequences of the pandemic, the spread of COVID-19 is generating unprecedented delays, disruptions and uncertainty in construction projects. She concluded emphasising that "water access is now more crucial than ever".

The final webinar participant was Roland Liemberger, international expert in NRW planning, with a presentation titled "After the crisis is before the crisis – Why and how to plan comprehensive NRW reduction projects". He started his talk saying this time we have been lucky, because the virus that causes COVID-19 has not been detected in drinking water, and the risk of transmission through sewerage systems is low, though we might not be so lucky next time. Although an intermittent water supply poses health hazards and other disadvantages, it is quite common in the world. Mr Liemberger's estimations show Latin America and the Caribbean are amongst the regions in the world with the highest levels of NRW; in fact, in the Caribbean, there is an average level of 147 litres/per capita per day of NRW. He then analysed the main reasons for high NRW, including a lack of incentives on all levels, and highlighted action needs to be taken now: "In a few years everyone in the Caribbean could be at an acceptable NRW level, if we start, and there would be no risk of intermittent supply anymore". To do that, it is necessary to quantify NRW and its components, commercial and physical losses. He ended his talk with some reasons to outsource NRW management, and steps to a successful NRW performance based contract (PBC).

After the final speaker, moderator Wayne Williams led a question & answer period. Webinar participants answered some questions from the audience. Mr Husbands answered a question on whether governments consider allowing utilities to delay remittance of the

The virus that causes COVID-19 has not been detected in drinking water, and the risk of transmission through sewerage systems is low

VAT tax to augment utility cash flow in lieu of revenue shortfalls, pointing out that VAT is part of governments' revenue, and given that currently governments' expenditures have significantly increased, if you take out their revenue source, they could not obtain the money needed to implement the broad social programmes contemplated: "In the absence of serious international support, I am quite sure governments are going to be hard pressed to do that". Other questions dealt with the implementation of digital processes, different contract models (PPP, PBC, concession), effective NRW reduction, utility processes considered for remote functions, and funding sources for water projects in Caribbean countries. Concerning sources of funding, Mr Komy noted that in the very short term, there will be less money, but in a longer term bracket there is a window of opportunity.

The webinar, directed towards water and wastewater personnel operating in the utility sector, was followed live by more than 140 people

FEATURE

THE WATER S

Olivia Tempest - Pablo González-Cebrián

ECTOR'S RESPONSE TO COVID-19

Water, fundamental for the existence of life, although many times undervalued, has become central to combat the coronavirus disease. Local authorities worldwide, along with water utilities, international organizations and NGOs, are working around the clock to provide the ever-necessary water and wastewater services to the global population, to fight the spread of the virus.

As lockdowns were enforced, numerous governments identified people working in the water and sewerage industry as key workers

The outbreak of the novel coronavirus COVID-19, which originated from Wuhan in China, is now a global pandemic affecting at least 187 countries. Given very little time to react, world territories established different counterattack plans to slow the transmission of the disease, which has also impacted the water sector.

As lockdowns were increasingly enforced, many governments identified people working in the water and sewerage industry as key workers. This allowed the sector to maintain continuity of operations at water and sewage treatment sites, in roads, or at the various control and customer centre offices. However, this is not the case in all countries. For example, in the Philippines, water engineers are not considered essential workers; therefore, must stay at home. This means burst pipes and other water-related issues are not attended to during the lockdown period.

Frequent handwashing with soap is one of the most effective ways to curb the spread of the coronavirus. In this regard, many countries have banned water shutoffs and restored water service to those households previously disconnected. Certain nations, including Italy, France and Bahrein, have taken a step further to protect their residents, especially those most vulnerable, by suspending the payment of utility bills. However, these decisions have varied widely due to the type of water management carried out in each territory, which is highly dependent on its own legislation or other factors such as weather or average wealth levels.

In the United States, the water industry is facing substantial financial losses. According to a recent report prepared for the AWWA and the AMWA, the combined water and wastewater sector impact of the COVID-19 crisis is calculated to be more than $27 billion. Nevertheless, Bluefield Research, an independent advisory firm, highlights that this pandemic could act as a catalyst to realizing needed step-changes in municipal infrastructure investment and utility operations going forward. Meanwhile, millions of Ameri-

INTERVIEW

Amit Horman
Chief Executive Officer at Miya

"WE DON'T FORESEE A SIGNIFICANT LONG-TERM IMPACT FROM COVID-19 ON THE INDUSTRY"

The CEO of Miya shares his thoughts on the repercussions the current health pandemic will have on the water industry

As lockdown measures were adopted, most countries directed all residents to stay at home, except those who were needed for the continuity of operations of essential critical infrastructure sectors, including water and wastewater.

For Miya, supplier of water and wastewater services in Europe, Caribbean and Africa, keeping its staff safe was, and continues to be paramount. During an interview with Smart Water Magazine, the CEO of the firm, Amit Horman, shared the steps the company had taken to keep its workers safe and facilities clean. He emphasized that they had supplied all employees with hand sanitizers and urged workers to comply with the guidance of official authorities to prevent infection. "In addition, we have allowed employees to work from home when possible and needed." To accommodate workers to carry out their chores remotely, Miya implemented the necessary technologies and tools. All business travel was also banned.

For those who could not work from home due to the nature of their jobs, mainly operations and customer service teams, Miya "provided additional protective equipment, such as facial masks, and promoted social distancing, under any circumstances."

Miya also took all the necessary precautions concerning its customers by launching an awareness campaign on

the company's website, various social media networks and through direct mail marketing. Amit Horman said that this was done "to encourage customers to use the phone, and our digital channels to contact us, instead of heading to the branches." Access control was also implemented to reduce the branches footfall to a minimum, and securing the required social distancing.

The coronavirus crisis spread across the continents in a very short period of time, not giving corporate leaders, public health directives or governments time to write an "operating manual." This is why Miya's CEO highlighted during the interview the need to monitor the situation daily: "As we do with any unusual event, we will watch what's happening locally and adjust business operation and policies as needed."

Regarding the impact of COVID-19 on the water industry as a whole, Horman is optimistic. "We don't foresee a significant long-term impact on the industry. We believe water utilities are amongst the most resilient sectors to an epidemic and for any financial crisis that can evolve as a consequence of that. Water consumption is rigid by nature and we think the sector will actually become even more attractive to investors."

The CEO's positivism transpires throughout the interview. He believes

that this crisis is a "wake up call for all industries to engage in precautionary measures to deal with similar cases." And he hopes that once this health emergency has passed, "we will grow as a society and strengthen our mutual responsibility between business, employees, consumers and governments."

INTERVIEW

Luca Buonerba
Chief Marketing and Business Developer Officer at De Nora

"THE IMPACT OF COVID-19 ON THE WATER SECTOR IS NOT LINKED TO WATER TREATMENT"

Phenomena such as absenteeism, service interruptions, technical assistance and maintenance provision are some of the main concerns for the water industry

De Nora's headquarters are in the city of Milan, in Italy, one of the worst-hit countries by the coronavirus pandemic. Providing a range of trusted disinfection, oxidation and filtration technologies and aftersales support services for water and wastewater treatment in the energy, marine and municipal markets worldwide, the company has continued to provide its indispensable assistance throughout the crisis.

In an interview with Luca Buonerba, Chief Marketing and Business Developer Officer at De Nora, we learn the measures the group has put in place to keep its employees from harms way, as well as how it is facing the growing pandemic and ensuring the company continues to run during such a difficult time. Numerous efforts have been put in place by the company to protect its workers. As well as fomenting telework, all employees have been provided with protective masks (FFP2 or FFP3), which are replaced under request. For those still working at the offices, sanitizer dispensers are available. "All colleagues have ben provided with a personal dispenser with sanitizer solution and additional solution is available at the main lobby for free refills," stressed Buonerba.

Cleaning has also been intensified, with commonly used tools and areas such as desks, chairs, door handles, restrooms, locker rooms and the canteen thoroughly scrubbed. Disinfection procedures, now, also take place twice a week. The company has also limited the access to certain common areas to ensure proper social distancing.

cans who have lost their jobs during the crisis, risk losing running water if they fall behind with bill payments in coming months, as water utilities in several states have not suspended the policy of shutoffs for non-payment.

In the United Kingdom, the industry put pandemic plans into action to ensure that they could continue to provide clean and safe drinking water to the population. Companies have also stepped up efforts to help customers who have lost their jobs during the coronavirus crisis. For example, Thames Water has doubled its Trust Fund donation to £1 million to support customers in financial difficulties. The British water sector has also been told to prepare for the likelihood of COVID-19 being present for two to three years by Dr Piers Clark, founder of Isle Utilities.

In some parts of the world, COVID-19 can be seen as an opportunity to accelerate access to safe drinking water and sanitation

Developing countries face both a straining challenge and an unexpected opportunity during this pandemic. In emergent nations, 75 per cent of households still do not have access to safe water to wash their hands appropriately with. In this respect, international organizations, including the United Nations, world media and non-governmental organizations, are shining a light on the chronic lack of funding for water infrastructure in these parts of the world, now that the economic benefits of water and sanitation have been emphasized. The health emergency which began by hitting China, Europe and the U.S., is spreading through Africa, Latin America and Oceania. In Africa, the highest risk of infection is found in densely populated slums, where there is poor access to health services, high rates of HIV and tuberculosis. Water shortages caused by poor water management, aging infrastructure and drought are also very common.

One of the major concerns water utilities and companies are having in relation to the health pandemic, is its impact on the industry. On the subject, Luca Buonerba reiterates that "the impact on the water sector is not linked to water treatment, but instead to possible phenomena such as absenteeism, service interruptions like delivery of chemicals, technical assistance and maintenance provision." This is because currently water companies have invested in infrastructure and undertake regular tests to ensure regulatory drinking water standards are met. "There is no evidence from surrogate human coronaviruses that these can be found in surface or groundwater sources or transmitted through contaminated drinking-water." "This absenteeism could affect drinking water and wastewater system operators in their ability to operate and maintain their systems adequately, thereby increasing the risks to public health. Absenteeism would also affect workers from other essential and interdependent sectors such as the transportation, power and chemical sectors. It could adversely impact on services such as delivery of chemicals, maintenance and other essential materials and supplies."

In regard to the impact the pandemic is having on De Nora, Buonerba says it is wide ranging. Although he highlights absenteeism and the continuity of the supply of raw materials as two main concerns: "we are trying to keep production unaffected as we directly supply and service critical industries making chemicals in addition to several water

and wastewater facilities (both public and private) where continuity of operations is critical to overcome the crisis."

Lastly, the company's Chief Marketing and Business Developer Officer, states that people staying at home is essential to overcome this situation. "Government institutions must employ clear and accurate communications, avoiding panic but giving clear indication that lock down and the use of all possible precaution like distance and additional disinfection of surfaces are the only available effective measure."

Across certain parts of Africa, COVID-19 has spurred governments to dispatch water tankers, drill boreholes and repair taps. However, experts and residents of rural villages and forgotten slums, have said these solutions must last long after the pandemic has passed. In these parts of the world, this crisis can be seen as an opportunity to accelerate access to water and sanitation and to strengthen water security.

We reveal two interviews (which can be read in full on the Smart Water Magazine website) on how De Nora, a leading supplier of water and wastewater treatment solutions, and Miya, a world leader in efficient water management, continue to provide essential services during the pandemic.

Many countries and states have banned water shutoffs and restored water service to those households previously disconnected

MARIANO BLANCO

HEAD OF INTERNATIONAL TENDERS OF AQUALIA, MEMBER OF THE EXECUTIVE COMMITTEE OF EUREAU AND MEMBER OF THE GENERAL ASSEMBLY

THE EUROPEAN SECTOR OF WATER SUPPLY AND SANITATION IN THE FACE OF THE COVID-19 PANDEMIC

I am writing 40 days after the lock-down started due to the Covid-19 pandemic which allows me to analyse to some extent what has been done and how the European water supply and sanitation sector has reacted, and it also allows me to put forward a few lines for the immediate future of the sector.

I begin the dissertation with quite a pertinent quotation from the prestigious historian John Elliott when he mentions the need to have a perspective of the past in order to form sound judgments: "And even so, because the facts are complex, because human beings do not always act rationally, and because chance is part of every historical event, there are always aspects of the past that will continue to elude us." In this way, the current case will be a historical fact that will be analysed in the future and, when there is sufficient perspective, it will probably be said that there has been a great deal of complexity, irrationality and things left to chance when explaining what has happened.

In Europe, the water sector represented by EurEau reacted in the first few days of the lock-down and organized a crisis committee

In Europe, the water sector represented by EurEau reacted quickly in the first days of the lock-down. In just hours, it organized a Covid-19 crisis committee with representation from each country, which in our case was through AEAS (the Spanish water national association). With this in mind, the idea that arose was to trace a path that would make simple what is complex, that would try to bring rationality to the actions, and that would not depend on chance, all with the greatest possible consensus.

As I have highlighted on other occasions, the 3 basic parameters of our management, public or private, are Quality, Continuity and Affordability, as water supply is an essential necessity for the entire population. The first aspect we made clear was the need to guarantee the safety of all employees and, at the same time, the obligation to ensure the provision of the service, maintaining our traditional and well-known vocation for service to society.

A dialogue was established with the corresponding European institutions, to convey that there are no health problems related to the supply of drinking water, nor to the sanitation of wastewater as current disinfection systems ensure an adequate level of protection against SARS-CoV-2. There is no risk either from the consumption of water or from its necessary activities (sampling in tanks and network, access to facilities, repairs, etc.). This coronavirus is very sensitive to disinfection processes, such as ozone, chlorine, UV radiation, alcoholic solutions and even ordinary soap; there are many efficient treatments to inactivate it.

Once the contacts between the various national associations began, several lines of action, as minimum measures to guarantee the service, were put together and transferred:

★ Implement contingency plans for a secure supply.

★ Create permanent crisis committees in each operator.

★ Promote recognition as operators of essential services (also including water laboratories, biosecurity and environmental health services, supply of goods, spare parts, equipment and technology, sludge and waste disposal services and, in general, all activities in the supply chain).

★ Ensure that employees can work as a team with the necessary isolation rules; for technical and occupational risk prevention reasons, certain activities require the presence of more than one employee in the same workplace.

★ Establish human back-up teams that remain isolated in their homes, in anticipation of infection cases among operating personnel.

★ Protect the personnel of call centres, laboratories, information systems, telematics control of infrastructure, etc. that allows efficient management without incidents.

★ Protect vulnerable consumers with low capacity of payment; this measure was already implemented long before the beginning of the crisis, making sure the water supply is not interrupted to those people who cannot pay for these services, although logically new cases will appear.

★ Guarantee the supply of chemical and sanitary reagents to successfully carry out the purification and treatment of waste-

water; not only for purification (flocculants, coagulants and disinfectants), but also for hydro-alcoholic gels, bactericides, disinfectant liquids, as well as protective equipment (masks, suits, disposable gloves, etc.).

★ Preventively strengthen the level of disinfection of drinking water, following the recommendations of health authorities and international organizations.

★ Resize the check points to guarantee the continuity of the services.

★ Suspend scheduled supply interruptions (maintenance or repair work).

In these and other measures that have been carried out, care for people (providers, employees and consumers), and the maintenance of the essential service for citizens prevails.

At the same time, singular measures have also been carried out according to the state of alarm:

★ Implementation of teleworking for office staff, not directly assigned to maintenance, repair, breakdowns, etc.

★ Closing of commercial service offices.

★ Reduction of personnel in call centres, to maintain security measures.

★ Suspension of extraordinary maintenance activities.

★ Creation of contingency control points to guarantee the continuity of services.

★ Creation of shift work for the use of common infrastructure and to avoid crowds.

★ Implementation of hygiene and disinfection measures in facilities, means and materials, all in accordance with the recommendations of the health authorities.

One aspect that I would like to highlight has been the permanent collaboration between the experts of each country; EurEau created a dashboard, regularly updated, to review the situation of the 500 million inhabitants who use our services, in order to find out the possible operational impacts and if these affect our clients. All this was done in a transparent, immediate way and with the intention of helping each other in the common strategy of guaranteeing effective and efficient management. The help that a federation such as EurEau provides to crisis situations is remarkable, where benchmarking of best practices has been carried out effectively and without associated costs.

As I have said on other occasions, the parameters of our management, public or private, are Quality, Continuity and Affordability

And now, what are the immediate measures in a post Covid-19 scenario? We have detected a series of major lines of improvement:

★ European water operators currently invest €45 billion annually. We support a response through a strong economic recovery Plan at an EU level, including our sector in that Plan.

★ The effects of the pandemic must be measured in terms of the ability to maintain current operating plans and committed investments, due to possible falls in income.

★ Financial support must be used in accordance with the key elements of the recently approved Green Deal.

★ The principle of Cost Recovery and adequate contribution of the user, and the Polluter Pays principle, must be kept in force, according to articles 7 and 9 of the DMA, as well as preventing harmful substances from reaching the treatment plants through the Extended Producer Responsibility schemes.

In these situations, the tremendous effort that has already been made in the sector to advance in the sustainability of our infrastructure, in their resilience and in the constant search for efficiency is evident. In the current situation, there has been a lot of work and effort in over-adaptation, but the guarantee and security of our services have been maintained.

The unpredictable and sudden change of life habits in cities, due to the coronavirus, has meant a great challenge for the daily operations and for the management of water companies' infrastructure. Fortunately, somehow, we were prepared to respond quickly to the crisis, and we have been able to guarantee the continuity of services despite the circumstances.

I conclude by stressing that we should be proud of what we are achieving, and we hope that a future analysis does not detect, in allusion to what I said at the beginning, either complexity or irrationality or anything left to chance in our responses.

ACWA POWER APPOINTED PREFERRED BIDDER FOR JUBAIL 3A IWP

The consortium comprising of ACWA Power, Kuwait's Gulf Investment Corporation and Saudi Al Bawani Water & Power submitted the lowest levelized water cost

The Saudi Water Partnership Company (SWPC) has appointed the consortium comprising of Saudi Arabia's ACWA Power, Kuwait's Gulf Investment Corporation and Saudi Al Bawani Water & Power as preferred bidder for the Jubail-3A independent water project (IWP).

The project includes the development, design, financing, construction, commissioning, operation and maintenance of the desalination facility with a potable water capacity of 600,000 m^3/day.

The project will also include storage tanks of one day production as well as in-house solar power to reduce the power consumption from the network.

The desalination plant, which will be designed using Reverse Osmosis seawater desalination technology, will be built on the Persian Gulf coast, south of the Jubail Industrial City, next to existing plant units (Jubail Phase 1, Jubail Phase 2 and Jubail RO plants). It will provide water to the regions of Riyadh, Qassim and the eastern provinces of the Kingdom.

The ACWA consortium submitted the lowest levelized water cost of Saudi Riyals 1.54861 or USD 0.41 per m^3 among the prequalified bidders

SWPC (formerly Water & Electricity Company) had initially, in 2018, invited expressions of interest for an integrated water desalination and power plant of 1,170,000 m^3/day of potable water capacity and 3,000 MW of power. The concept was later revised, and the company decided to divide it into two IWPs of 600,000 m^3/day potable water capacity for Jubail-3A and 570,000 m^3/day potable water capacity for Jubail-3B.

Shuaibah IWPP, Saudi Arabia.
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METAWATER ACQUIRES ALL SHARES OF WIGEN

METAWATER Group to expand its business in North America

METAWATER has acquired 100% of the shares of Wigen, a U.S.-based water treatment equipment supplier.

Wigen specializes in membrane filtration and ion exchange technologies for municipal drinking water, industrial water, and reclaimed water treatment market in the United States.

In the United States, due to drought caused by climate change and water shortage caused by population growth, there is a growing demand, mainly in the Southwest, for the process of using treated wastewater for drinking water. Through the acquisition of Wigen as a subsidiary, METAWATER Group aims to enhance the company's presence in the rapidly growing potable water reuse market in the United States. And together with Aqua, which became a subsidiary in January 2016, it will strengthen and expand its North American business by leveraging synergies with the resources of each company.

Ken Akikawa, Director and President, METAWATER USA said: "We are very pleased and welcome Wigen, which has a unique and different strength with Aqua, to become a part of our group. By combining METAWATER's differentiated technologies with the advantages of those both companies in North America, we will provide suitable and innovative solutions not only to the reclaimed water market, where its demand will continue to spike but also to the new problems on the water quality. METAWATER Group keeps striving on improvement of the water environment in North America."

KURITA WATER INDUSTRIES ANNOUNCES MERGER OF ITS U.S. SUBSIDIARIES

Kurita Water Industries announces merger of U.S. subsidiaries creating Kurita America

Kurita Water has completed the merger of its consolidated subsidiaries in the United States, including U.S. Water Services, Texas-based, Kurita America, Fremont Industries, LLC, and Global Water Services Holding Company. The newly combined company will be known as Kurita America and will be headquartered in St. Michael, MN. LaMarr Barnes, former CEO of U.S. Water, will lead Kurita America, as Chief Executive Officer.

By merging the four consolidated subsidiaries based in the United States, Kurita America has integrated their sales, production, marketing, commercial offerings and administration systems to maximize the overall efficiency of business operations to provide comprehensive integrated solutions to its customers.

"The integration of these companies represents an unprecedented opportunity to leverage and expand the collective strengths of our legacy brands with Kurita's worldwide global leadership," said LaMarr Barnes, CEO of the new Kurita America. "Kurita's industry leading technologies and capabilities will enable us to deliver more powerful and impactful integrated solutions for our customers."

The new Kurita America intends to change the way the marketplace views water and process treatment. Together, the combined subsidiaries that embody Kurita America represent decades of collective industry expertise across a wide range of industries such as healthcare, food and beverage, agriculture, light industry, commercial and institutional, biofuels, and municipal drinking water.

BILL GATES-LED FUND INVESTS IN NATEL ENERGY

Natel Energy completes a successful deployment of its fish-safe Restoration Hydro Turbine

Natel Energy, a supplier of sustainable hydropower solutions, has closed an $11 million investment, led by Schneider Electric Ventures and supported by Breakthrough Energy Ventures. The company will use the funding to accelerate deployment of its flagship product, the Restoration Hydro Turbine (RHT), which enables cost-effective production of low impact, distributed baseload energy, while maintaining the health of watershed ecosystems and surrounding communities.

The investment comes on the heels of the successful deployment of an RHT at the Freedom Falls project in Maine. The RHT is a unique, innovative turbine that combines top performance with industry-leading fish safety and an extremely compact footprint that reduces installed cost by over 20% compared to conventional low-head options.

The fish-safe RHT enables upgrades to existing low-head hydropower plants which simultaneously improves power output and river connectivity. Natel's holistic approach of Restoration Hydro aims to build cost-effective hydropower projects that can help restore watersheds generating renewable energy, as well as multiple environmental co-benefits. Data and analytics are core to this hydropower future, and HydroForecast™ and Lens™ - software solutions offered by Natel subsidiary Upstream Tech - deliver decision-support for all watershed stakeholders, including hydropower utilities, to design, build, upgrade, restore and optimize green and grey watershed infrastructure for climate resilience.

"THE INTERNATIONAL HYDROPOWER ASSOCIATION (IHA) HAS HELPED TO ADDRESS MANY MISCONCEPTIONS ABOUT HYDROPOWER"

Will Henley, Head of Communications, International Hydropower Association (IHA)

The vital role of adequate communications by water companies and organizations has become even more apparent amidst the coronavirus pandemic. Will Henley, Head of Communications of IHA, assesses the challenges of communicating about hydropower, and the usefulness of digital communications.

Olivia Tempest

How do you think communication in the water sector has evolved in recent years?
Over the past decade there has been a transformation in the way we think and communicate about water, the water-energy nexus and interdependencies with the environment, society and commerce. A major turning point was the adoption of the Sustainable Development Goals in 2015 including Goal 6 to achieve universal and equitable access to safe and affordable drinking water and Goal 7 to provide affordable, reliable, sustainable and modern energy for all. We have now moved from a philosophy of explore and exploit to sustain and be sustained by. The language of corporate communications has adapted with forward-thinking organisations joining the dots between their activities and the achievement of the SDGs.

Why do you think it is important to communicate about water?
As an elemental force, water is deeply symbolic and provides great emotional resonance, especially for those with a personal connection to a river, lake or sea. I grew up near Teddington lock in London where the River Thames becomes tidal. Every encounter with water is spiritually uplifting. I still live close to the river and I am a keen kayaker so I find water to be awe inspiring. You only have to look at the iconic photograph of the Earth taken by the Apollo 8 crew, of our blue planet rising above the Moon, to appreciate the preciousness of water. This makes water communication so important and personal.

What are the most challenging aspects of communicating about hydropower?
IHA has helped to address many misconceptions about hydropower over the past 25 years. Nonetheless, the multiple benefits of hydropower are often still forgotten or undervalued. This technology is not only the largest producer of renewable energy, it also provides benefits in safely managing freshwater. Hydropower infrastructure can alleviate the impacts of flooding and drought, while providing clean water for homes, industry and agriculture. The flexibility and storage services hydropower provides are also under-appreciated, even though they are needed to support increasing penetrations of fast-growing variable renewables. With the onset of climate change, we have very little time to decarbonise our economy, so it's vital that hydropower is seen as part of the solution by decision-makers everywhere.

Could you highlight one of your organization's communication success stories?
As a membership association, IHA recognises the importance of building a vibrant community, a strong sense of belonging and an affinity with our mission. Understanding this, a year ago we launched a new online community, Hydropower Pro, allowing members to connect with each other and share insights. The Covid-19 pandemic is a reminder of the importance of digital communications and engagement, especially to organisations with members in all corners of the globe. We now have a space for more democratic, two-way conversations between us and our members.

BY: ÁGUEDA GARCÍA DE DURANGO

SOMETHING TO READ...

WASTE TIDE:

A must-have techno-thriller

Chen Qiufan authors this science-fiction novel where the main character, Mimi, lives on an island to which waste arrives from the Chinese mainland. In this setting, local gangs fight for power, while American companies seek more benefits. The war between rich and poor, tradition and modern ambition, past and present, is on the cards.

SOMETHING TO WATCH...

DARK WATERS:

An environmental legal drama

Mark Ruffalo is a lawyer who puts everything on the line against a large corporation in this film based on a true story: the controversial case of chemical pollution in a small U.S. community by DuPont. Directed by Todd Haynes, the film follows the main character through 19 years of his life.

SOMETHING TO FEEL...

ECHOES IN RAIN:

Music for the quarantine

Music for the quarantine
We feature Irish singer and songwriter Enya in this media library with her first single of her eighth studio album, Dark Sky Island, published in 2015. “Echos in rain” is a peaceful melody, in line with her previous work. Perfect to listen to at home on a stormy day.

Making a difference in the digital transformation of the water and environment sectors

Smart Solutions for the Digital Utility

+225M€

R&D investment

+450

utilities around the world use our solutions

+100M

clients are managed with our commercial system

- Customer Management
- Smart Metering
- Work Force Management
- Plants & Energy Management
- Water Network Management
- Energy efficiency
- IA, Big Data & Analytics Services
- Cybersecurity Services

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