

THE **DISRUPTIVE** WATER MAGAZINE

smart

JUN
JUL
2022
13

BENTLEY SYSTEMS:

Digital Twins to make better decisions

ENVIROSUITE:

Technology to tackle operational, safety and environmental challenges

SINGAPORE: CLOSING THE WATER LOOP

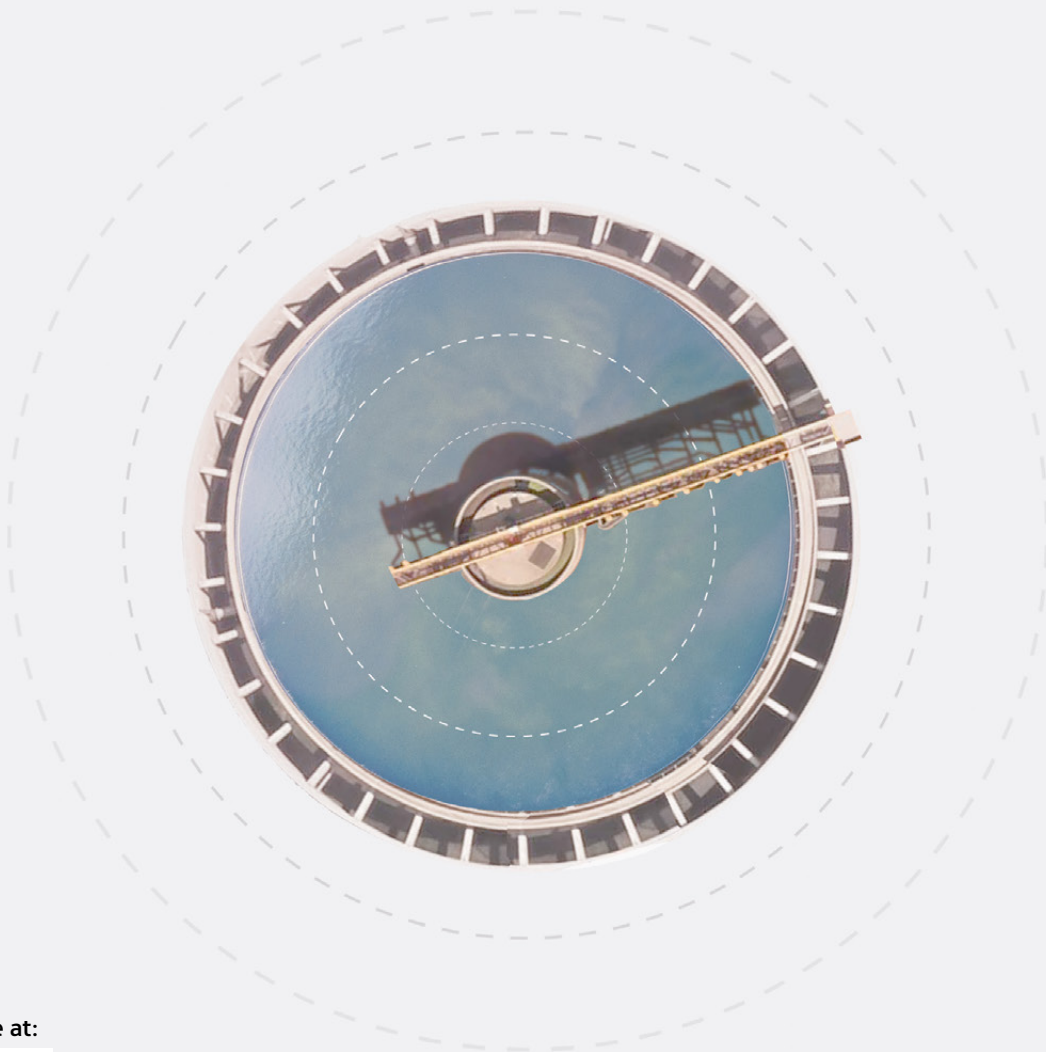
NEOM:

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Inflation stalls major water infrastructure renewal in US

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BUSINESS AS UNUSUAL

FROM THE EDITOR

EFFICIENCY AND DIGITALISATION IN THE FACE OF ECONOMIC AND GEOPOLITICAL RISKS

The world is living in uncertain and worrying times due to the evolution of the war in Ukraine and the inflationary spiral of the economy, among other circumstances. The consequences for the water industry have not been long in coming and are already having a major impact on the management of water operators and manufacturers of all types of equipment. Our editor-in-chief, Olivia Tempest, analyses in this issue of Smart Water Magazine Bimonthly the situation in the United States, where the initial enthusiasm for the American Rescue Plan presented in 2021 by the Biden Administration has fallen victim to delays and readjustments of the most emblematic projects.

Faced with this situation, which can be extrapolated to the rest of the planet, the only thing to focus on is efficiency. A good example is the case of Singapore, a city-state that has made a virtue out of necessity, managing in recent decades to

turn water from a limiting factor for its growth into a true emblem of its technology and management capacity. We analyse all this in an interview by Cristina Novo with Dr Pang Chee Meng, Chief Engineering and Technology Officer at Singapore's National Water Agency, in which he highlights the firm commitment to achieving net zero carbon emissions by mid-century. The secret? Reducing the energy consumption of PUB's water treatment processes and increasing the use of clean, renewable energy in these processes.

Another major trend in our sector is undoubtedly digitalisation. In these turbulent times, and with the growing threat posed by the consequences of climate change, digital solutions are consolidating as key elements to increase the

resilience of water management systems. A good example is the deployment of a digital twin by Bentley Systems in Uttar Pradesh (India), which has enabled the best decisions to be made in a project that will guarantee quality drinking water for 1.5 million people.

In short, circumstances are pushing us to do more with less. But this is nothing new for the water industry, which has always come out stronger in the face of crises. I am convinced that, decades from now, we will look back on the twenties of this century as the turning point of the circular economy, energy efficiency and digitalisation. And we at SWM will be witness to this. Enjoy the magazine.

ALEJANDRO MACEIRA - DIRECTOR SWM

@amaceira - @AlejandroMaceiraIaAgua

PUBLISHER

iAgua Conocimiento, S.L.
C/María de Molina, 41.
Spaces Building. 28006. Madrid
info@iagua.es

MANAGEMENT

Alejandro Maceira Rozados
David Escobar Gutiérrez

EDITOR

Alejandro Maceira Rozados

EDITORIAL STAFF

Águeda García de Durango Caveda
Laura Fernández Zarza
Paula Sánchez Almendros
Olivia Tempest Prados
Cristina Novo Pérez

ADVERTISING

Javier de los Reyes

ART AND GRAPHIC DESIGN

Pablo González-Cebrián
Esther Martín Muñoz



smart
water magazine



INTERVIEW

**A MODEL CITY FOR
WATER MANAGEMENT**

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FEATURE

**THE FUTURE
OF SMART WATER**

Pg. 66 ACCIONA makes the case for investing in smart water cities to tackle the challenges facing the sector in the coming years.

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NETWORK CHALLENGES**

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**DATA TO TURN
INSIGHT INTO ACTION**

Pg. 24 Utilities with the capacity to interpret available information can take steps to increase efficiencies and move to proactive management.

An aerial photograph showing a winding asphalt road that curves through a dense, lush green forest. To the right of the road is a calm, blue lake. In the background, a small town or village is visible across the water, with buildings and more trees. The sky is clear and blue.

Water. Failure is Not an Option.

Water professionals know that sustainability is fragile. With water scarcity and droughts becoming more commonplace each day, the water sector needs to rethink how it does things. We need to work smarter, fully digital, and with greater transparency. By collaborating with stakeholders in a digital twin, we can learn from the past, make better decisions today, and create a better future for all.

Going Digital will get us there faster.

To learn more about OpenFlows, visit:
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FEATURE

**PORTABLE
DESALINATION IN LA PALMA**

Pg. 78 As the Cumbre Vieja volcano raged, Tedagua worked against the clock to supply irrigation water and protect livelihoods in the island.

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**PUTTING
NEOM ON THE MAP**

Pg. 26 NEOM's head of water, Gavin van Tonder, speaks to SWM about their ambitious plans for a sustainable city built from scratch.

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**NO PLAN B
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Pg. 60 Innovative software and services by Bentley Systems connect the entire water cycle to optimise water infrastructure and mitigate risks.

FEATURE

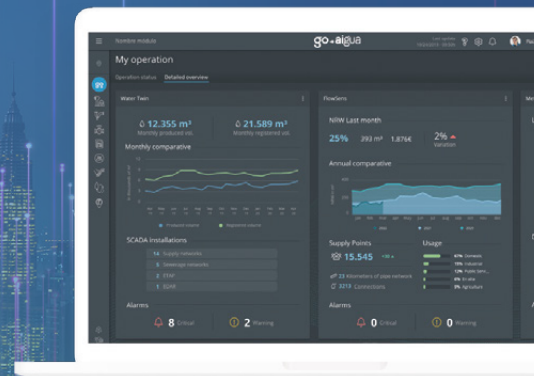
**THE EFFECTS OF
INFLATION**

Pg. 20 Inflation is taking its toll on U.S. water utilities, dampening plans to make necessary upgrades to their infrastructure.

go-aigua

Smart Water – Simplified.

Bringing together process and infrastructure information to optimize operations and decision-making in utilities.



Actionable information for utilities

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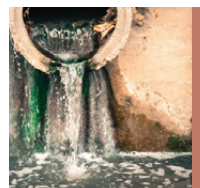
Idrica develops projects with an international outreach to drive digital transformation in utilities.

Find out more



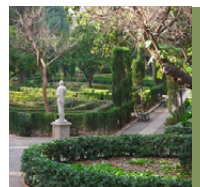
WATER

Supply networks and DWTPs



WASTEWATER

Sanitation networks, storm drainage and WWTPs



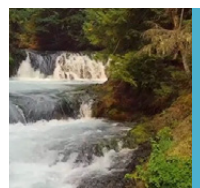
IRRIGATION

Automation of urban irrigation



AGRICULTURE

Agricultural irrigation infrastructure and networks



WATER RESOURCES

Early warning systems and smart management

FEATURE

EFFICIENCY IN BIOGAS PRODUCTION

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INTERVIEW

A TOOL FOR WATER SUSTAINABILITY

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CONNECTIVITY AND MUCH MORE

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CLOSING THE WATER CYCLE

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ANOTHER LOOK AT WATER IN AFRICA

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A SOLUTION FOR AIRPORT OPERATIONS

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TAKING ACTION NOW

Pg. 72 To tackle the effects of climate change, a different mindset and taking action are key. Change is the only sustainable option.

OPINION

SAN DIEGO EMBRACES WATER REUSE

Pg. 34 Amy Dorman delves into the details of Pure Water San Diego, which by 2035 will produce nearly half of the city's drinking water.



THE MAGAZINE FOR THE KEY PLAYERS OF THE WATER SECTOR



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AN OPPORTUNITY FOR CREATIVITY

Pg. 86 Alex Mung (World Economic Forum) invites us to make a concerted effort and reimagine innovation in water as we approach 2030.

APPOINTMENTS

NEW FACES IN THE WATER SECTOR

Pg. 10 Read about some of the most important appointments that have taken place recently in the water industry across the world.



THE PERSON OF THE MONTH

WILFRIED BRUTSAERT, "MR EVAPORATION"

Pg. 14 Renowned hydrologist Professor Emeritus Wilfried Brutsaert, "Mr Evaporation", has been awarded the 2022 Stockholm Water Prize.

SPEAKERS' CORNER

COMMUNICATING WATER SCIENCE

Pg. 100 Simon Williams offers a glimpse of communications at the UK Centre for Ecology & Hydrology to ensure the centre's research has an impact.

INTERVIEW

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Pg. 16 SWM interviews the researchers involved in a recent study on agreements between water utilities in the US to mitigate their risks.

#SWMB13


smart
water magazine

APPOINTMENTS

MEET THE NEW FACES IN THE MOST INFLUENTIAL WATER SECTOR ENTITIES

In this section we have compiled the most important appointments that have taken place recently, and entail taking up a position or role within influential entities (public, private or mixed) in the water sector.



GOH SI HOU

GOH SI HOU NAMED SINGAPORE'S NATIONAL WATER AGENCY PUB CHIEF EXECUTIVE

Mr Goh Si Hou, 44, a member of the PUB Board since 2021, has been named chief executive of the agency, succeeding Ng Joo Hee

Singapore's national water agency PUB has appointed Goh Si Hou, former Chief of Singapore's Army, as its new chief executive, effective July 22.

Goh Si Hou has been part of PUB's board since Apr 1, 2021 and was most recently the Chief of Army in the Singapore Armed Forces (SAF).

Goh succeeds Ng Joo Hee, who will retire from the Administrative Service. Ng became PUB chief executive in 2015 after serving as Singapore's Commissioner of Police from 2010 to 2015 and Commissioner of Prisons from 2008 to 2010.

Singapore's Ministry of Sustainability and the Environment (MSE) released a press statement highlighting Ng's work during his time as chief executive. Numerous significant water infrastructure developments were commissioned, including the Tuas Desalination Plant in 2019, the Marina East Desalination Plant in 2020 and the Jurong Island Desalination Plant in 2022.

"The commissioning of these plants has further strengthened Singapore's water security," said the ministry.

Ng also spearheaded sustainability projects, like developing PUB's floating solar farms at reservoirs and the co-location of PUB's water reclamation plant with the National Environment Agency's (NEA) waste management plant Tuas Nexus.

Mr Ng also drove an organizational-wide effort to improve health and safety, and implemented a comprehensive competency framework in PUB.

The ministry said: "MSE would like to place on record our deep appreciation to Mr Ng for his leadership and valuable contributions to PUB, and welcome Mr Goh."



NADER ANTAR

**SAUR APPOINTS NADER ANTAR AS PRESIDENT OF
THE COMPANY'S INTERNATIONAL DIVISION**

He brings 20 years of international experience in strategy, business development and P&L leadership

Saur has named Nader Antar as President of the company's International Division, with effect from June 1st.

As a member of the General Management Committee, Nader will contribute to the development and sustainable growth of all the firm's international operations. He will also provide the strategic leadership needed to win new contracts and acquire new companies in the years ahead.

Nader has a BSc in Computer & Communications Engineering from the American University of Beirut, an MSc in Communications Engineering from the Technical University of Munich, and an MBA from INSEAD.

He has 20 years of international experience in strategy, business development, P&L leadership and transformation change management across a broad spectrum of industries and companies, including SITA, Honeywell, United Technologies Corporation and OTIS elevators, where he was until recently Regional President, Chief Transformation Officer and Head of Strategy for Europe, the Middle East & Africa.

Combined with his engaging personality and leadership skills, his richly diverse international experience will enable him to address all strategic international development challenges faced by Saur.

Nader will be based in Dubai, and will report directly to Patrick Blethon, Executive Chairman of the Saur Group.

In a statement, Blethon said: "I wish him every success in his new role and assure him of my total commitment and support."



PETER INGARRA

**ZWITTERCO APPOINTS PETER INGARRA AS
VICE PRESIDENT OF SALES**

Peter Ingarra has led world-class sales teams and knows what it takes to implement breakthrough water treatment solutions

ZwitterCo, a company providing innovative membrane products that treat historically unfilterable streams, announced Peter Ingarra as Vice President of Sales to accelerate growth as the company continues its rapid expansion. His responsibilities include sales team leadership, increasing revenue with new customer acquisitions and commercial partnerships, and marketing and business strategies. As a member of ZwitterCo's Executive Management Team, Peter will drive customer success strategies.

"Peter's expertise will strengthen our efforts to help industries reuse water and ensure a future of water abundance," said Alex Rappaport, co-founder & CEO of ZwitterCo.

Peter brings nearly 20 years of experience in sales and marketing roles, working for Rohm and Haas, The Dow Chemical Company, and DuPont. Most recently, Peter was the Americas Commercial Director for DuPont Water Solutions, where, through his leadership, the region developed strong end-use customer relationships by solving their most pressing technical challenges and sustainability objectives. He is a graduate of Dominican University and holds an MBA from Drexel University.

"The technology that ZwitterCo offers will revolutionize the wastewater industry as we know it," said Peter. "I am excited to bring my experience in a market-leading brand to strengthen a team committed to their mission of preserving water resources. Their technology provides profound performance advantages that solve customer problems in wastewater treatment and water reuse."



CAROLINA RINFRET

**WATERPOWER CANADA NAMES CAROLINA RINFRET
PRESIDENT AND CEO**

Clean and secure hydroelectricity more important than ever as new leader takes helm at Canada's national association

WaterPower Canada appointed Carolina Rinfret as the association's new president and chief executive officer.

Rinfret has close to 20 years of legal, regulatory and government relations experience in hydroelectricity and the broader energy sector. She has expertise and a track record of achievement that equip her well to lead the association, during what will be a period of ongoing growth to enable the energy system transformation.

A lawyer by training and a member of the Barreau du Québec (Québec Bar association), Rinfret began her legal career in private practice. She subsequently spent more than a decade with Hydro-Québec. In appearances on its behalf before the Régie de l'énergie du Québec (energy regulator) she secured approval for investments of more than \$2.5 billion for the construction of high-voltage lines and substations connecting both generating stations and the province's first wind farms to its transmission grid.

Rinfret subsequently served as senior legal counsel for TC Energy, responsible for its legal affairs in Québec. Most recently she held a senior legal and regulatory affairs director position with Gazoduc Inc., the proponent of an underground transmission line intended to supply a natural gas liquefaction facility.

At WaterPower Canada she will lead a team tasked with providing advocacy, research and other services, all aimed at maximizing the waterpower industry's contribution to meeting Canada's energy needs and decarbonization objectives.



PROFESSOR OTTMAR EDENHOFER

**EU CLIMATE ADVISORY SELECTS PROFESSOR
OTTMAR EDENHOFER AS ITS CHAIRPERSON**

His task will be to represent the Advisory Board, which is to provide the European Union (EU) with independent scientific knowledge

The European Scientific Advisory Board on Climate Change has elected Ottmar Edenhofer as the Board's first chairperson. Ottmar Edenhofer is professor of the Climate Economics and Public Policy at the Technische Universität in Berlin, Germany, Director and Chief Economist at the Potsdam Institute for Climate Impact Research, and Director of the Mercator Research Institute on Global Commons and Climate Change.

From 2008 to 2015, Ottmar Edenhofer served as Co-Chair of Working Group III of the International Panel on Climate Change (IPCC) and was the group's lead author contributing to summaries of the IPCC's 5th assessment report (AR5) and the special report on Renewable Energy Sources and Climate Change Mitigation.

In 2020, the Web of Science citation index ranked Ottmar Edenhofer in the top 1% of the most cited scientists in the world in the interdisciplinary science category. During the past three years, the newspaper Frankfurter Allgemeine Zeitung has placed Ottmar Edenhofer in the 20 most influential economists in Germany. Professor Edenhofer advises and collaborates in many boards and committees nationally as well as on European and international level.

The European Climate Law, adopted in June 2021, sets out a binding objective of climate neutrality in the EU by 2050 in pursuit of the long-term temperature goal set out in the Paris Agreement. It also provides a framework for achieving progress in pursuit of the global adaptation goal established in the Paris Agreement.

Resilient Infrastructure Group has appointed Paul Schuler as Executive Vice President of Sales and Service. Resilient develops and invests in transformative water and wastewater solutions that meet our clients' site-specific business, financial, and sustainability objectives.

Schuler's water and wastewater industry experience includes nearly five years at Suez Water Technology & Solutions where he led North American sales. At Suez WTS and GE Water, Schuler tripled top-line regional revenues and drove considerable organizational and profit growth. As a recognized water industry leader, he has served on the Water Environment Federation and the Pacific Northwest Clean Water Association boards.

"Paul's decades of water industry expertise and client-first approach are perfectly matched with our growth plans," said Ben Vitale, CEO. Resilient's utility "as a service" delivery coupled with flexible and innovative financing structures, and independent technical solutions, enable resiliency across mission-critical infrastructure, operational consistency, and control over facility costs. This outsourcing approach supports clients that need new facilities or to upgrade existing assets to drive step-function improvements in sustainability metrics to reach corporate goals.

"We are very excited to welcome Paul to Resilient especially at this stage," said Bill Brennan, President. "His broad water treatment knowledge, coupled with building and managing enterprise sales and marketing teams at GE-Suez, are world-class."



PAUL SCHULER

**PAUL SCHULER JOINS RESILIENT INFRASTRUCTURE
AS EXECUTIVE VICE PRESIDENT**

He will deliver fit-for-purpose water and wastewater solutions for clients to achieve business, technical and sustainability objectives

Lawrence Gosden has been appointed Chief Executive Officer of Southern Water with effect from 1 July 2022. This follows the announcement at the start of the year of Ian McAulay's intention to retire.

Lawrence returned to Southern Water in 2020 as Chief Operating Officer. Having previously spent 12 years at Thames Water in a variety of senior executive roles, he played a key role in improving their environmental performance and increasing wastewater customer service. Lawrence started his career as a graduate at Southern Water and has over 30 years' operational and capital programme delivery experience in the water industry.

Commenting on the appointment, Keith Lough, Chairman, said: "The Board and I would like to thank Ian for the leadership and skill he has shown in carrying Southern Water through an enormously challenging period. He has led the transformation across the business and its culture, putting in place strong governance, operational and systems changes, which have enabled new investment in our business and from which we will now build.

I would like to congratulate Lawrence on his appointment, which follows an open and rigorous process."

Lawrence Gosden said: "Southern Water has made great strides in improving transparency and putting in place the foundations of change. We know we must continue to improve, and quickly. Working with the committed teams across Southern Water, we are ready to deliver the next phase of the transformation our customers and the environment deserves."



LAWRENCE GOSDEN

**SOUTHERN WATER ANNOUNCES
LAWRENCE GOSDEN AS CEO**

After 37 years in the water and environment sector, Ian McAulay announces his retirement and Lawrence Gosden steps in as CEO

PROFESSOR EMERITUS WILFRIED BRUTSAERT

2022 STOCKHOLM WATER PRIZE LAUREATE

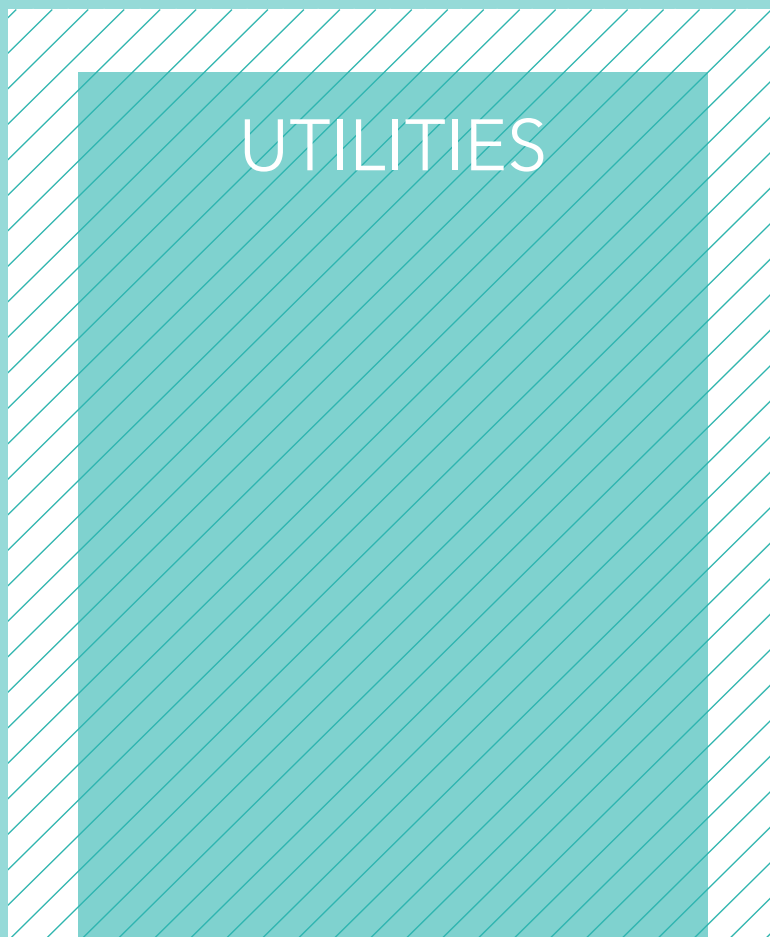


Renowned hydrologist Wilfried Brutsaert has been awarded the 2022 Stockholm Water Prize for his pioneering work to quantify environmental evaporation, a key part of the water cycle which is very difficult to estimate. His work on evaporation and hydrology is of lasting importance, especially for climate change science, but also for practical water resource management.

Known affectionately as "Mr Evaporation", Professor Brutsaert found that estimations of the role of evaporation could be improved by incorporating developments in atmospheric turbulence and the interaction with the surface energy budget of the Earth. His findings have enabled more accurate predictions of the impact

of climate change on precipitation patterns and water sources. In particular, his research helped to improve predictions of the magnitude of evaporation, and thus indirectly of precipitation, at the local level.

Born in Belgium, Dr Wilfried Brutsaert has worked at the Department of Civil and Environmental Engineering at Cornell University for more than 50 years, where he is currently Professor Emeritus. He is also known for new approaches to study changes in groundwater storage, another key aspect of the water cycle. In this regard, his research has contributed new knowledge on the effect of global warming on the water cycle in thawing permafrost regions.



UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL/CORNELL UNIVERSITY

“This study provides a new type of guidance to water managers in the real world”

A growing population, urbanization and economic growth are increasingly putting more and more pressure on urban water supply systems. These facilities are also threatened by the effects of climate change, such as water quality deterioration, longer periods of droughts or more frequent flooding. Are inter-utility agreements the answer to these rising challenges?

 OLIVIA TEMPEST

Urban water utilities in the United States, but also anywhere in the world that faces similar challenges in supply and demand and in affordably financing infrastructure improvements, are partnering with neighbouring utilities to help mitigate their risks. This cooperation between water utilities was the topic of research chosen by a group of academics from the North Carolina Research Triangle to identify the viability of both fixed and adjustable capacity agreements. David Gorelick, Postdoctoral Research Associate, Center on Financial Risk in Environmental Systems, Institute for the Environment and Department of Environmental Sciences and Engineering, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, was joined by Gregory Characklis, W.R. Kenan Jr. Distinguished Professor, Center on Financial Risk in Environmental Systems, Institute for the Environment and Department of Environmental Sciences and Engineering, Gillings School of Global Public Health, University of

North Carolina at Chapel Hill, David Gold, Doctoral Candidate, Department of Civil and Environmental Engineering, Cornell University and Patrick Reed, Joseph C. Ford Professor of Engineering, Department of Civil and Environmental Engineering, Cornell University to carry out this study.

The research used supercomputer allocations on the Stampede2 system of the Texas Advanced Computing Center to develop a computational model along with regional utilities in North Carolina to simulate the utilities' risk management and long-term infrastructure planning decisions out until 2060. We had the opportunity to speak with the authors to find out about the conclusions of the study and how it could help water utilities looking to form new inter-utility agreements to face rising demands and limited supply expansion options.

Where did the idea of studying water utilities' cooperation come from?

Our interests in utility cooperation came from two perspectives: conceptual and practical. Academically, we wanted to explore challenges faced by water utilities beyond the service boundaries of a single system. Though agreements between utilities or municipalities for managing water resources are widespread, there are very few existing research efforts to assess their performance in terms of both water supply and financial outcomes. Because every contract and investment a utility makes is reflected in the water bills that we all pay, it's vital to understand what can make, or break, an effective agreement.

In a practical sense, we became interested in studying water utility cooperation because it is happening in our own backyard. In the North Carolina Research Triangle, where more than 2 million people share the water resources of Raleigh, Durham, Chapel Hill, and other growing communities, utilities are cooperating to develop a regional water



David Gorelick, Postdoctoral Research Associate, Center on Financial Risk in Environmental Systems, Institute for the Environment and Department of Environmental Sciences and Engineering, Gillings School of Global Public Health, University of North Carolina at Chapel Hill



David Gold, Doctoral Candidate, Department of Civil and Environmental Engineering, Cornell University



Patrick Reed, Joseph C. Ford Professor of Engineering, Department of Civil and Environmental Engineering, Cornell University

Gregory Characklis, W.R. Kenan Jr. Distinguished Professor, Center on Financial Risk in Environmental Systems, Institute for the Environment and Department of Environmental Sciences and Engineering, Gillings School of Global Public Health, University of North Carolina at Chapel Hill



treatment plant. How it will be financed and operated, however, remains an open question. From our standpoint, it was a great opportunity to offer timely solutions for a real-world problem.

What entities collaborated on this research project?

This project was a partnership between the Center on Financial Risk in Environmental Systems (CoFiRES) at the University of North Carolina at Chapel Hill (UNC) and researchers of the Department of Civil and Environmental Engineering at Cornell University. Under the direction of Drs. Gregory Characklis (UNC) and Patrick Reed (Cornell), our work also involved engaging with water managers and planning staff at utilities across our study area so that we could receive essential feedback and improve the accuracy of our modelling efforts. This work would not have been possible without input and guidance from staff at the Orange Water and Sewer Authority

(OWASA, serving Chapel Hill), City of Durham, City of Raleigh, Town of Cary, Town of Pittsboro, and Chatham County Public Utilities.

For this study, you used TACC's Stampede2, the supercomputer of the Extreme Science and Engineering Discovery Environment (XSEDE). What role did it play in the study?

The supercomputing resources from XSEDE are what make this work possible. With TACC, we are able to explore millions of potential future scenarios to understand which uncertainties might leave the Research Triangle water supply system vulnerable. That includes possible changes in climate, water demand growth, utility decision-making, and other factors. Doing so allows us to discover robust water management strategies that adapt to changing future conditions. Using XSEDE's capabilities, we can evaluate millions of future scenarios in a matter of hours. To evaluate these

scenarios on a modern laptop would have taken us more than a decade.

The study found the cooperation between utilities is good; however, the type and manner of cooperation is very important for water utilities. Can you tell us a bit more?

Our study focused on the different types of cooperative agreement that utilities can enact, while also describing the financial mechanisms that enable them. In the case of the Research Triangle, this was a contract that coordinated the ways in which partner utilities would pay for and allocate capacity in a new regional water treatment plant. Under a more flexible agreement structure, which allows partners to renegotiate their treatment capacity and financial shares over time, cooperating utilities benefit from an ability to dynamically respond to changing environmental and financial conditions. However, when agreements are updated over time, a utility can also

"In a practical sense, we became interested in studying water utility cooperation because it is happening in our own backyard"

be exposed to the risks and uncertainties of their partners, including the possibility that a neighbouring utility cannot meet its financial obligations. This result was in contrast to outcomes under fixed agreements that do not update over time, where utilities are limited to the mitigation of their own risks and more insulated from the concerns of other partners. So, while cooperation was beneficial for the Research Triangle overall, partnering utilities must take care as to how cooperation is structured to avoid taking on unnecessary risks.

Water systems are facing increasing challenges including changing climate and population growth. How did this study take these factors into consideration?

Infrastructure investments on the scale we're studying cost hundreds of millions, or even billions, of dollars and are expected to provide reliable water for decades. But predicting what the future will look like decades from now is incredibly difficult. So, rather than trying to guess what the future will look like decades from now, we shift the question. Instead of developing a water management strategy meant to work perfectly in our best guess of the future, we search for a strategy that will perform well across a broad set of future conditions. Our study evaluated each potential management strategy across millions of possible future conditions incorporating different climate and weather projections, water demand growth trends, and more. By including these uncertainties in our evaluation, we feel confident that this study provides a

new type of guidance to water managers in the real world.

For the research, you developed a computational model together with regional utilities in North Carolina. Will you be looking to export this study to other parts of the U.S.? What about the rest of the world?

Our goal was that the results of this work would be applicable far beyond North Carolina. Inter-local agreements between municipalities, of which inter-utility agreements are a subset, exist in many places across the U.S. and the world. Though every region and water supply system is different, the modelling framework we developed can serve as a



general template for effective risk assessment of cooperation in other contexts.

We continually work to communicate our results directly with water managers and utility finance personnel. It is vital to share these insights with practitioners and industry decision-makers, as more utilities begin to consider inter-utility agreements. Anyone who drinks municipal

water could benefit from this work – we hope that it helps identify best management practices in regional utility cooperation, we found economies of scale that will save utilities money and slow, or even halt, increases in consumer water bills.

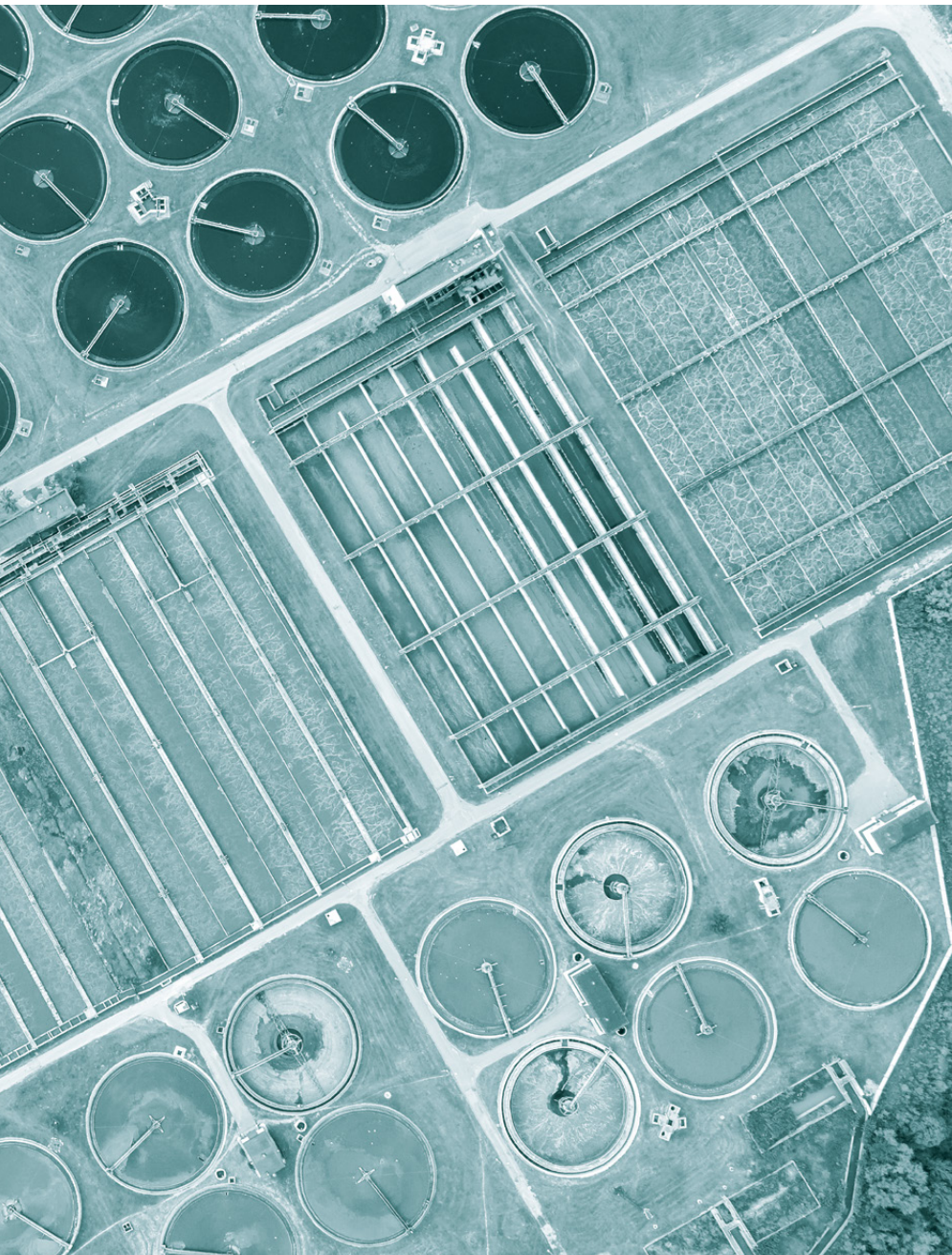
What are some of the risks you found of inter-utility agreements?

"Since every investment a utility makes is reflected in the water bills we pay, it's vital to understand what can make, or break, an agreement"

There are two sides to this: risks that may imperil the success of an agreement, and risks that an agreement may exacerbate.

Because inter-utility agreements are often equivalent to long-term contracts to build and/or operate infrastructure that lasts decades, they are subject to numerous environmental and social uncertainties. If water demand and the consequent water sales, the primary revenue source for a utility, does not grow as projected over that time period, an agreement could become a financial risk as a utility earns insufficient revenue to pay off bonds used to finance utility infrastructure. That financial risk is often passed to customers, in the form of higher water bills. Climate change, drought, or weather volatility can also threaten the reliability of an agreement; if water is not available to be treated or transported to customers, or if future water availability is more difficult to forecast, the risk of water supply failure rises. This is especially true for neighbouring utilities that share the same climatic and weather conditions.

On the other hand, an agreement itself may have consequences. Utilities accustomed to independent planning and operation can become exposed to risks of non-performance by their agreement partners. For instance, if one utility suffers a financial crisis and cannot honour its end of an agreement to provide water during drought, other partners may be impacted and forced to compensate for the reduced revenues and/or increased cost. In extreme cases, this could lead to legal concerns as well.



INFLATION DAMPENS WATER UTILI

After the initial enthusiasm the federal infrastructure investment caused in the water industry, utilities across the U.S. planning to use the funds to make very necessary upgrades to their networks are being hit by the reality of inflation and the rising prices of fundamental equipment.

 OLIVIA TEMPEST

Aging infrastructure has been one of the top issues water utilities face in many parts of the world, but it is a plaguing matter in the United States. America's decaying water infrastructure is made up of miles and miles of water pipes installed in their majority in the early to mid-twentieth century that are in dire need of modern-day upgrades. Driven by inadequate investment in rehabilitation and replacement, numerous studies, like Black & Veatch's annual survey on water point out that 80 percent of utility workers believe this issue is the most challenging facing the industry. Moreover, the 2018 survey of water industry professionals by the American Water Works Association (AWWA) also listed the renewal and replacement of aging water and wastewater infrastructure as the top issue in the water industry. In 2019, drinking water infrastructure earned a D grade on the American Society of Civil Engineers (ASCE) Infrastructure Report Card, the same grade as in 2017.

In recent years, however, the perception had altered slightly and was regard-

ed with more optimism. This could be due to technological innovation, the expansion of federal financing programs and utilities making investments in their networks. In 2021, ASCE awarded water infrastructure a C- after years of grading it with a D. Nevertheless, the authors of the report highlighted that there is still a long way to go. "There is a water main break every two minutes, and an estimated 6 billion gallons of treated water lost each day in the U.S."

A needed influx of federal money

Faced with an increasing delicate water infrastructure, which does not only include water pipes – water mains, sewage lines and storm drains, but reservoirs, pump stations, and treatment plants, the U.S. Congress approved in March 2021, The American Rescue Plan Act. The act gave state, local and tribal governments access to \$350 billion to repair water and sewer infrastructure. To date, legislatures, states, territories, and Washington, D.C. have already dedicated at least \$10.1 billion in ARPA funds to water systems, reported Circle of Blue.

In November 2021, President Joe Biden signed into law the Infrastructure Investment and Jobs Act. A "once-in-a-generation investment" in infrastructure, it authorized \$1.2 trillion to be spent over five years. It will improve drinking water and sanitation in three major ways: by addressing lead pipes, PFAS contamination and ageing sewage systems.



Rising prices

These two sources of funding were a source of optimism for the water sector, but this enthusiasm has been dampened by worldwide inflation, where prices are rising to their highest levels since the early days of the Reagan administration.

In early March, the independent insight firm, Bluefield Research, had

In 2019, drinking water infrastructure earned a D grade on the American Society of Civil Engineers (ASCE) Infrastructure Report Card

TIES' INFRASTRUCTURE PROJECTS



warned in its report *U.S. Water & Sewer Pipe Network Infrastructure: Market Trends and Forecasts, 2022 – 2030* that “the municipal utility market, like many others, faces uncertainty ahead with respect to inflationary pressures.”

“Acute supply chain constraints stemming from pandemic shutdowns, workforce disruption, and climate volatility

(e.g., Texas Winter Storm), are driving record inflation in water and sewer pipe material prices. In some instances, prices for plastic, steel and iron pipes have shot upwards by more than 75.1% from October 2020 to October 2021.”

Nevertheless, Bluefield had predicted that the newly available sources of funding would drive over US\$104 bil-

Congress approved in March 2021, The American Rescue Plan Act. The act gave state, local and tribal governments access to \$350 billion



These two sources of funding were a source of optimism for the water sector, but this enthusiasm has been dampened by worldwide inflation



lion of hardware and equipment investments by municipal utilities in the U.S. over the next decade.

Since March, inflation has continued to increase and is taking a toll on the entire U.S. economy, not only the water industry. Fuel, housing and food costs have soared, and it is quickly becoming one of President Joe Biden's biggest challenges.

Kelly Green, Administrator of Water Infrastructure Financing for Michigan's environment agency, told Circle of Blue that almost all utilities have had to veer their plans due to the higher costs. "I have not heard of any community that is on target with what they originally budgeted."

"Maybe they were thinking of removing 300 service lines, and now they're going to remove 150 service lines instead."

The price of a foot of water pipe in Tucson, Arizona, has shot up 19%, according to the Daily Press. Likewise, lead service line replacements that usually cost around \$5000 per line are now several thousand dollars more expensive.

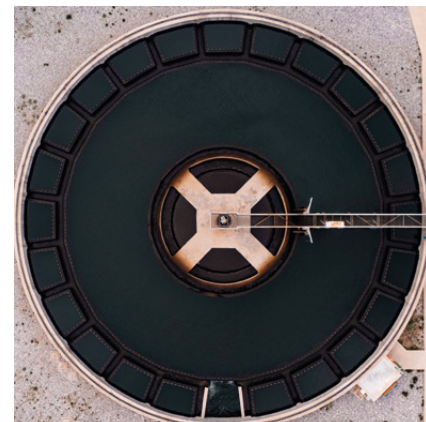
Inflation is forcing state, local and tribal officials to defer projects, concentrate on smaller ones or rearrange their agendas

In the last year, the value of other materials has risen, including concrete pipe (16.2 percent), copper pipe (20.8 percent), fabricated steel (39.8 percent), and PVC pipe (35.6 percent).

According to data from the Federal Reserve Bank of St. Louis, ductile iron pipes and fittings that are also commonly used by water systems were nearly 25% higher compared to last year.

The invasion of Ukraine by Russia has also impacted prices in the water industry. Stainless steel, often used in water networks, has grown considerably as Russia is a leading producer of nickel, a component of stainless steel.





Inflation is scaling back water infrastructure projects across the country. Costs have risen so much that state, local and tribal officials are deferring projects, concentrating on smaller projects or rearranging their agendas.

Scott Schladweiler, Tucson's chief water engineer, told the Daily Press: "To sum it up, we're doing less work for the same amount of money."

Michael Arceneaux, acting CEO of the Association of Metropolitan Water Agencies, added: "In the end, it's going to be the rate payers that suffer because the projects have to get done, and funding will have to come from the rate payers."

Indeed, residential customers are already feeling the effects of inflation in their monthly bills. The average monthly water utility bill in the U.S. is now up \$5.73 from 2020 — without a corresponding increase in consumption, found a recent study by J.D Power. This has led customer satisfaction to decline with residential water utilities, ending six consecutive years of improving or flat satisfaction levels, highlighted the study.

The average monthly water utility bill in the U.S. is now up \$5.73 from 2020 — without a corresponding increase in consumption

MICHAEL NATSCHKE

DIRECTOR BUSINESS DEVELOPMENT, CENTRAL & NORTH EUROPE AT XYLEM

WHEN IT COMES TO MODERNISING OUR WATER INFRASTRUCTURE, DATA

The modernization of water operations is gaining pace as utilities across the world lean into the potential of digital technologies. While the benefits of smart solutions are well understood – from automating processes and workflows to remote monitoring and control of critical assets – it's not just about having the right technology; it's about mining the data generated to unlock insights that sustainably enhance utility operations.

Digitally-enabled utilities have access to growing volumes of operational and performance data, but distilling that data into useful information, and knowing how to apply it, can be a barrier to success. A growing number of utilities are breaking down this barrier by combining digital solutions and expertise like hydroinformatics to make sense of their data. By having the right tools and resources in place, utilities have the power to turn insights into action and deliver transformative outcomes for the communities they serve.

Breaking down the barriers with data integration

Traditionally, utility business models have tended to reinforce siloed ways of working. This is largely down to how the utility has evolved over time – particularly in response to situational factors like the geographic dispersal of assets and personnel, as well as changeable environmental factors like extreme weather events. Too many systems, provided by multiple service providers mean that the solutions, and those that manage them, often work disconnected from each other.

The beauty of data and analytics, however, is that they are not constrained by physical boundaries. Digital solutions have the power to create synergies between data sets and utility functions, breaking down the barriers to connect systems together. Smart equipment, like SCADA systems and other third party data sources connected to a controlled open analytics platform, puts a holistic value on the data generated by a utility's entire system, helping them gain greater network visibility. Working with a trusted partner to cleanse and structure this data appropriately, utilities can extract the insights needed to bridge

the gap between data and decision-making. Not only does this holistic approach deliver unrealised benefits for the utility, but it also opens up possibilities for further digital development by fostering innovation and interdepartmental collaboration.

Harnessing data to turn insight into action

In Europe, utilities at various stages of data maturity have been riding the digital transformation wave with great success, with the differentiating factor being their capacity to filter and interpret the information available to them. Underpinned by collaborative partnerships, these utilities are embracing a new era of water management – one that relies on digital solutions and data analytics to drive operational efficiencies, reduce risk and build resilience.

Take the City of Trier, for example, located in southwest Germany. The City's main wastewater treatment plant, operated by Stadtwerke Trier, was a large consumer of energy – drawing hundreds and thousands of kilowatts (kWh) from the public grid just to maintain operations. By investing in energy-efficient technology, the utility was able to significantly reduce its energy consumption. In-

spired by this progress, they wanted to implement an innovative control solution that would increase efficiencies and allow them to close the energy cycle within the plant.

Working with Xylem, Stadtwerke Trier deployed a Wastewater Network Optimization (WWNO) solution based on artificial neural networks which are used to create data-driven models for the degradation of carbon and nitrogen compounds. The system receives all the parameters and data required for this in real-time from the plant's existing SCADA system, and the resulting digital twin simulates hundreds of scenarios within seconds so that the required aeration intensity for the biological degradation of the compounds can be identified.

Leveraging the advanced WWNO solution, a forecasting model was created to predict both the energy consumption and pro-

As well as operational efficiencies, harnessing data can also help utilities address challenges like asset redundancy or over-dimensioning

IS POWER



duction at the plant. When comparing the optimised results with the utility's historical data, the utility was able to identify an important parameter for success; the specific energy required to eliminate one kilogram of load. This is not usually calculated or controlled, though it can ultimately cause unnecessary plant fluctuations and impact overall operational efficiencies.

Since the implementation of the solution, Stadtwerke Trier has been able to eliminate avoidable fluctuations and reduce energy consumption related to aeration processes by up to 20%, representing a saving of 200,000 kWh per year – enough to power 50 private households.

From reactive to proactive system management

Outside of driving operational efficiencies, harnessing the right data can also help utilities address challenges like asset redundancy or over-dimensioning. Utilities with limited resources are often confronted with a great deal of uncertainty, particularly in the face of climate change and changeable weather patterns. For utilities early on in the digital journey, they'll often implement a security margin – installing three pumps instead of one – in a bid to cover the risk of system failure.

However, digital solutions capable of producing predictive outcomes can allow those utilities to move from a reactive to a proactive approach when it comes to failure management. When operating under a reactive model, utilities lack the flexibility needed to tackle system issues quickly and efficiently, which puts a huge premium on getting the decision making right. Predictive solutions that use machine learning and advanced analytics empower utilities to plan for tomorrow while freeing up much-needed finance to reinvest in other areas of their operation.

Such data-driven risk models are already being deployed globally, particularly in the US where, amidst the climate spiral, utilities are managing 2.2 million miles of underground pipes with finite resources. For example, the City of Raleigh

Public Utilities Department maintains a drinking water distribution system that dates back to 1887, and they needed to prioritise capital works using analysis to determine pipeline risk.

Working with the utility we were able to conduct a probability of failure analysis using historical data in their GIS, and utilise Xylem's Asset Performance Optimization (APO) solution to identify clusters of high risk individual pipes – optimising their selection for maximum risk reduction. Identifying high risk clusters allowed the City to prioritise pipe replacement projects, reduce mobilisation expenses, minimise disruptions and reduce capital planning time by 75%.

The APO solution also guided the implementation of a pilot program for remote pressure sensors across the utility's network. Due to the high cost, blanket coverage of the City's system was infeasible, but the identified high risk clusters allowed the utility to determine where to place the sensors to best target problematic regions.

The downstream impact is transformative. Not only did the solution enable the utility to detect pipe breaks earlier, but it also supported continuous monitoring of the region after repair – moving the utility from

reactive to proactive system management.

Predictive solutions that use ML and advanced analytics empower utilities to plan for tomorrow while freeing up much-needed finance

Fast tracking digital transformation

As utilities across Europe and beyond continue to implement these innovative and highly digitized solutions, more and more data is unlocked, and new ground is broken. Technologies that harness the power of data and analytics are enabling water managers to make smarter capital and operational decisions, transforming water management for not just the benefit of the utility, but the communities they serve.

By sharing best practices and insights from across the industry, utilities can better understand how to maximize these technologies and master the art of the possible – fast-tracking the digital transformation of water.



INTERVIEW

GAVIN VAN TONDER



EXECUTIVE DIRECTOR OF WATER, NEOM

“We have been given an opportunity to show the world what a high-performing water utility can look like”

NEOM means “new future”: a region in northwest Saudi Arabia on the Red Sea being built from scratch. Conceived as a hub for innovation and a model for sustainability, NEOM is one of the Public Investment Fund projects, a key piece of Saudi Arabia’s Vision 2030 plan for economic diversification.

 CRISTINA NOVO PÉREZ

Water is integral to NEOM’s success. Intended as a centre of excellence for global water technology, the project counts on Saudi Arabia’s desalination expertise to, for the first time, produce water through desalination powered entirely by renewable energy and with zero liquid discharge. Gavin van Tonder, Executive Director of Water, leads the development of NEOM’s water and wastewater system, designed to be completely sustainable. In this interview, he tells SWM about the plans to make this living laboratory live up to its own expectations: becoming a global reference point for industry leaders and changing the future of water.

Can you briefly tell us about your career path and your current role at NEOM?

At NEOM, I am developing greenfield water infrastructure and implementing cutting-edge, high-recovery desalination and wastewater technologies. These include zero liquid discharge strategies that eliminate liquid waste and maximize water efficiency when managing wastewater.

I am also leading plans to create a smart water distribution and transmission network for the NEOM giga-project.

Over the years, I have held senior engineering, field service and C-suite positions with companies around the globe. My roles have seen me working in the energy and utility sectors, including oil, gas, and water, focusing on innovative, smart solutions, systems and products that deliver efficiency and performance.

Having initially set out in the water industry in 2001, my career took me to Schlumberger, where I fulfilled a range of field service and engineering roles in locations, including London, Mumbai, Shenzhen, Singapore, and Vietnam.

While working at Itron in France and Austin, Texas, I eventually became President of the Water Division, assuming responsibility for the sector’s global strategy, management, and growth.

I have started factories, facilities, and water infrastructure from the ground up in China, India, Indonesia, Australia, Malaysia, and Mexico. I presently serve on

the advisory boards of many water technology companies across Europe and the Americas. Previously, I served on boards in China, Indonesia, India, and Australia.

In 2018, I accepted the exciting role of developing and executing the water strategy in NEOM, which led to the business and implementation plans, all of which are well underway.

I hold a bachelor’s degree in Applied Science in Chemical Engineering from the University of KwaZulu-Natal in South Africa.

Historically human settlements flourished close to sources of water. What factors have led to leaving that dependency behind?

Human settlements initially flourished close to surface water sources, but then, due to advancements in extraction technologies, expanded into areas where water is also available underground. Many historic settlements quickly outgrew their surface water sources and came to rely heavily on water extraction from



"The population explosion has made processing wastewater properly and efficiently the central issue in today's water industry"

aquifers or water pipelines over long distances. The Romans and the Nabateans relied on gravity for water capture and transfer. Modern technology has enabled water pumping over distances, both horizontal and vertical.

The main issue today is processing wastewater properly and efficiently. Around the world, nearly 50% of wastewater is still returned to our environment without proper treatment, polluting our scarce freshwater resources. The population explosion has made this the central issue in today's water industry.

To what extent do you think technology can address any sustainability concerns? Is this easier to do in a greenfield project than in an already existing development?

To be sustainable is often thought of as development without harming our natural environment. I think we have made sufficient progress toward this to justify turning our attention to enhancing our environment, not merely doing it no harm. An example of this is stopping water abstraction from the groundwater to enable greening of the surface or full recycling of water to ensure we attain a fully circular economy. The rewilding of nature and ensuring the provision of natural drinking and irrigation water are also important and attainable goals, as are preventing stormwater and sewage runoff from impacting our marine environment and focusing development on smaller areas while returning extraneous land to its natural state.

Utilizing technology to do this is key. At present at NEOM, we are focused on perfecting renewable energy desalination,

accomplishing 100% wastewater capture through treatment, recycling and reuse. Most interestingly, we are looking at the utilization of smart sensors to be able to reduce water losses, which are a significant hindrance to sustainable water usage the world over. By mastering this, we will help protect the environment, minimize infrastructure sizes and reduce energy demand and chemical usage.

Being 'water positive' as opposed to merely sustainable is about asking the world what processes we can use to be more efficient with water. Personal consumption is not the leading cause of water inefficiency, and while it is important to take individual responsibility for water conservation, we need to look more at how we can improve consumption from, for example, agriculture and energy generation. The U.S. utilizes 43% of its freshwater abstraction for energy generation, which could be reduced by increasing the usage of renewable energy. Similarly, in the Kingdom of Saudi Arabia, around 90% of water goes to agriculture – an amount that could be alleviated by a greater focus on greenhouse production and a reduction in the use of pesticides.

Building a greenfield project as opposed to working on an existing development comes with different challenges and opportunities. Building a greenfield project has many benefits in upfront design and planning and the injection of new technologies. However, if an existing utility is allowed to run profitably and there is an investment in new technologies, then the same end results can be achieved.

How close is large-scale desalination using renewable technologies becoming a reality at NEOM? What about elsewhere in the world?

At NEOM, the design for our renewable desalination project has been completed. Land preparation has been completed, and construction is starting later in 2022.

Feasibility studies have shown that our plans for brine processing can indeed create a profitable enterprise.

NEOM's location enables some of the best wind and solar energy effectiveness in the world. We are investigating pumped hydro, concentrated solar power, geothermal utilization, battery storage and green hydrogen utilization. We are also very interested in other new technologies, such as gravity power desalination and utilizing pumped



seawater hydro to complete our renewable energy supply.

NEOM plans to use a circular design for a smart water network for NEOM. Can you tell us about the water solutions planned to ensure a sustainable and cost-competitive water supply with zero liquid discharge?

We plan to terminate all groundwater abstraction and move to a 100% desalination water supply. We will utilize renewable energy for all energy requirements and commit to a maximum of 3% water losses to reduce whole infrastructure and operational costs.

We are also committed to 100% recycling of wastewater to reduce water desal-

"We are focused on perfecting renewable energy desalination, accomplishing 100% wastewater capture through treatment, recycling and reuse"



Being 'water positive' as opposed to merely sustainable is about asking the world what processes we can use to be more efficient with water



ination production by 20%, protecting the marine environment from stormwater runoff, and capturing the water for reuse and groundwater injection. The design of our water storage will utilize only renewable energy for pumping and will generate energy from micro-hydro grids for further energy storage. We are implementing a minimum viable construction process for the growth of the infrastructure over time. This reduces upfront CAPEX and OPEX until it is really required.

NEOM's plan is to implement desalination alongside brine processing, generating revenue from brine processing to offset the cost of water production and moving us toward a zero-production cost water system.

NEOM has been defined as a "living laboratory." Do you expect the technologies and practices to be used at NEOM will be exported to the other Public Investment Fund projects (Qiddiya, Amaala, The Red Sea Development Company project...) and the rest of Saudi Arabia?

We have been given an opportunity to show the world what a high-performing water utility can look like, and we need to use that to foster change in the way water is perceived globally. Our initiatives have already driven change in the desalination market. Global interest is now very high in brine processing and we see more investment going in that direction.

The Red Sea Development Company project and Amaala are very interested in seeing how our brine processing project evolves as they consider whether they can use it going forward to reduce their impact on the environment.

In short, what is done in NEOM will benefit not just the industry, but the world.

How will digital technologies support water systems at NEOM?

Technology at NEOM is a means to an end, never the end itself. We are using technology to solve problems and increase efficiencies. Digital technologies bring efficiency to operations, reducing

the overall cost of water and enabling a much higher level of service.

At present, the core function of our technology is to collect data and input it into a digital twin that will be used to guide initial construction and then, crucially, to manage ongoing operations. If we want to achieve less than 3% losses in the system, we need digital technologies to identify anomalies and resolve them quickly. Digital technology will be our eyes and ears in the field, allowing us to be responsive to issues and events when they occur. From a safety perspective, digital technologies will ensure we guard against any water quality issues.

Developing digital twins for several projects throughout NEOM has been a crucial way to reduce our environmental impact, increase efficiency and create a truly cognitive development – a core aspiration for NEOM. The digital twin of our water infrastructure that we are developing with international partners is going to drive the global industry in a digital direction once we have demonstrated its capabilities.

Traditionally, water utilities are government entities with a captive market, no competition and little incentive to provide a high quality of service. Digital technologies enable that to change and will have ripple effects through the whole market dynamic.



What would you say to critics who see NEOM as something out of a science fiction novel or as greenwashing a place intended only for the very wealthy?

We welcome criticism from those with experience and knowledge. Ecocity in China, with which I was involved, is a joint venture between the governments of Singapore and China that started development in 2007. I remember there were many international critics at the time, yet there is now a large population living in what was previously coal field mining dumps. The critics who did not believe are gone, and the believers who had experience and knowledge are there.

We are investigating pumped hydro, concentrated solar power, geothermal utilization, battery storage and green hydrogen utilization



A focus on sustainability and the environment is key to the development of NEOM. Any country in the world building a city from scratch is developing for the future and not the present, so while it may seem like science fiction, the world will be very different in 2030 and the plans must be laid now. Does it look like science fiction? Maybe, but it is for the future, so of course, it must seem futuristic, or we wouldn't be doing our job.

The size of NEOM and the expected population will demand a range of different jobs and people. A hydrogen plant, desalination plant, brine processing plants and greenhouses for agriculture all need to be operated. All the facilities will require operators and support staff, so to say it is only for the wealthy demonstrates a narrow understanding of what we are creating in NEOM.

People who want to understand what we're doing should visit us and get a first-hand experience of what we have already accomplished on the ground. They will leave transformed - of this, I am sure!

"We will utilize renewable energy and commit to a maximum of 3% water losses to reduce whole infrastructure and operational costs"



SCHNEIDER ELECTRIC AND AVEVA DIGITIZE KUNMING CGE WATER SUPPLY

The municipal water company KMCGE services a population of nearly four million residents with its 10 treatment plants



Schneider Electric, the leader in the digital transformation of energy management and automation, and AVEVA, the global leader in industrial software, driving digital transformation and sustainability, are reshaping the digital core of Kunming CGE Water Supply's (KMCGE) water management system.

The combination of AVEVA and Schneider Electric software, technology and water domain experience are providing KMCGE with better operational management, improved visualization of energy usage and a safer, more reliable, sustainable, and efficient water distribution process.

Kunming is the capital and largest modern city in China's southern Yunnan province. Its municipal water company KMCGE services a population of nearly four million residents with its 10 treat-

ment plants, with a total water supply capacity of 1.58 million cubic meters per day, and a water distribution network that stretches over more than 2,000 kilometres. As the city grows, KMCGE needs to continue to expand the scale of its water supply.

While primarily implemented to ensure a safe, stable and more efficient municipal water supply, digitalisation is critically important to reducing overall operating costs and driving sustainability in water distribution systems. Through the partnership, KMCGE has reduced leakage and energy waste and improved operational and maintenance efficiencies, allowing it to continue supplying high-quality drinking water.

KMCGE chose Schneider Electric and AVEVA for the technological performance and visibility offered by their

solutions, as well as the deep trust generated through their 10-year long relationship. When it came time to upgrade the system, KMCGE wanted a new production scheduling system that would not only include the data accessed by the existing system, but also integrate a whole host of additional data on its water sources, plants, transmission and distribution networks, energy use, and water quality.

Schneider Electric deployed the EcoStruxure for Water & Wastewater solution that builds on KMCGE's installed base, including Modicon M340 PACs, Altivar ATV1200 and ATV630 variable speed drives, medium and low-voltage power distribution systems, integrated with AVEVA System Platform software and EMS+, an energy management services platform, to provide visibility and unify operations in Kunming Water.

With its ability to integrate the performance of the connected devices and edge products, AVEVA System Platform provides KMCGE with a "digital core" for its updated water distribution management platform. The EMS+ system collects and centralises key data on water sources, water plants, pumping stations, distribution networks, and water quality. This wealth of data is then made available for analysis and reporting to help KMCGE formulate and refine effective water supply plans and make production scheduling more transparent, flexible, and efficient, ultimately optimizing the entire process, from production to distribution.

YORKSHIRE WATER PARTNERS WITH HYDRAULIC ANALYSIS TO TACKLE LEAKAGE

The trial hopes to save 1.7 million litres of water from leaking out of the water network every day

Yorkshire Water will partner with Hydraulic Analysis and Morrisons Water Services as part of a programme to deliver a £28 million investment to help meet its target of halving leakage by 2050.

The companies will use innovative leakage detection technology to target 20 hotspot areas, that have been historically difficult to identify and rectify leakage. Most of the hotspot areas are based in city centres, where many large customers, traffic noise and complex supply arrangements make the resolu-

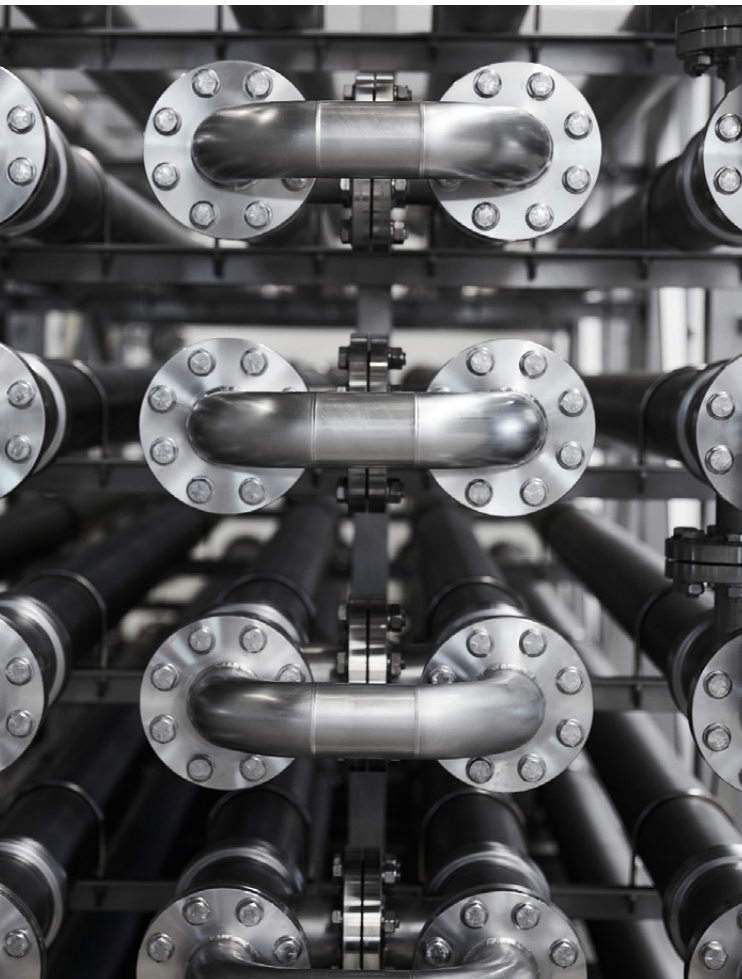
tion of background noise, consumption, and leakage difficult.

The trial hopes to save 1.7 million litres of water from leaking out of the water network every day. The solution will use flow meters, pressure sensors sampling at a high frequency and acoustic loggers. It will be underpinned by the Hydraulic Analysis digital twin, which uses near real time data to drive a hydraulic model of the Yorkshire Water network. The analytics system will identify network performance issues.



Adam Smith, manager of smart networks and metering transformation at Yorkshire Water, said “This project has the potential to change the level of service and reduce leakage in some areas of the network. The technology we will deploy helps us to reduce costs, whilst saving carbon and delivering our key objectives.”

Lee Wood, contract director at Morrison Water Services, said: “We are confident we will revolutionise the way Yorkshire Water manages leakage and its network performance.”



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AMY DORMAN

ASSISTANT DIRECTOR, PURE WATER PROGRAM. CITY OF SAN DIEGO PUBLIC UTILITIES DEPARTMENT



CITY OF SAN DIEGO'S PURE WATER PROGRAM

In August 2021, construction began on the largest infrastructure project in the history of the City of San Diego. When completed in 2035, the potable Pure Water system will generate nearly half of the City's drinking water.

Pure Water will use proven purification technology to clean recycled water and produce safe, high-quality drinking water. The program offers a cost-effective investment for San Diego's water needs and will provide a reliable, sustainable supply.

The fact that the water will be locally produced is significant because currently San Diego imports as much as 90% of its water. With threats of recurring droughts in California, having a local water resource is more important than ever. That is why the Pure Water Program is a key part of San Diego's Climate Action Plan for the City's resilience.

Pure Water will be a massive system built in two phases. Last year the City broke ground on Phase 1, which is scheduled to be completed in 2025. This phase consists of 11 construction projects, including the North City Pure Water Facility, pump stations and pipelines. Once completed, the City will be able to deliver 30 million gallons a day (mgd) of purified water to customers. Phase 2 is still in the planning stage but will include similarly intricate construction projects and produce an additional 53 mgd of purified water.

Because the construction projects are occurring in several neighborhoods, the City conducts a major outreach program to keep the public informed through regular presentations, meetings and social media posts. The Pure Water website includes interactive maps that allow residents to see regularly updated construction schedules and how they will affect their areas. The website also has a virtual tour video of the Pure Water Demonstration Project that shows viewers a step-by-step description of how the system works.

The process of turning wastewater into drinking water is complex. Wastewater will be diverted from the City's

Point Loma Wastewater Treatment Plant and pumped to the North City Water Reclamation Plant. The recycled water will then be transferred to the Pure Water Facility where it will undergo a state-of-the-art, five-step treatment process that includes ozonation, biological activated carbon filters, membrane filtration, reverse osmosis and ultraviolet light with advanced oxidation.

The water will then be transferred to a City reservoir and processed at a water treatment plant before it's delivered to customers through the City's water distribution system. With the completion of Phase 1, San Diego will be one of the first water suppliers to implement indirect potable reuse with a reservoir.

Upon the implementation of Pure Water, flows and solids

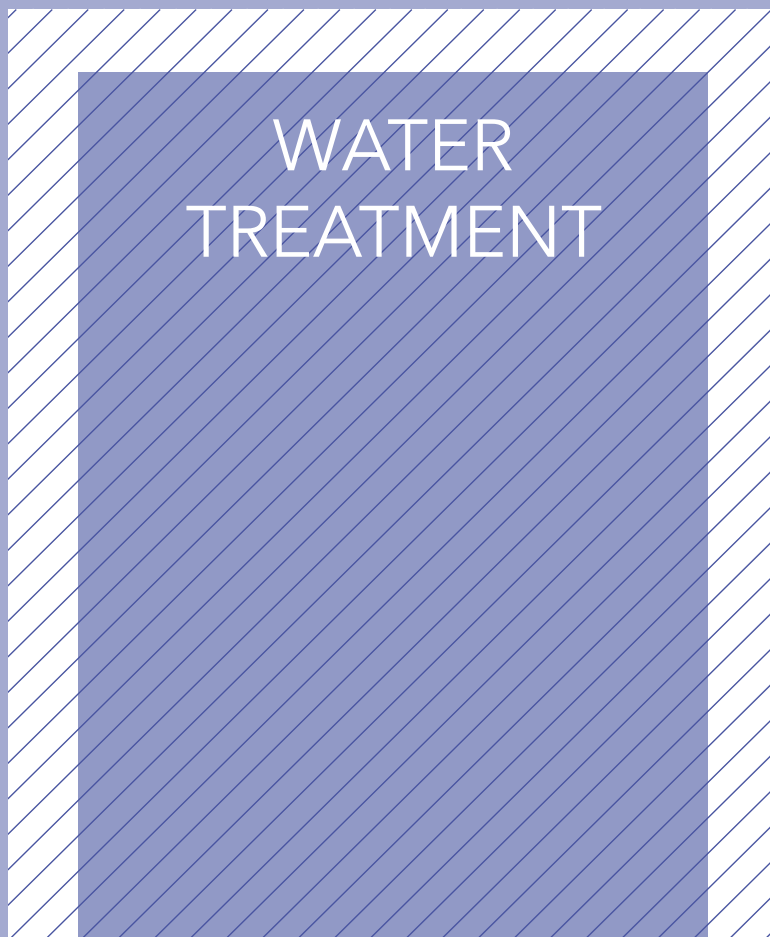
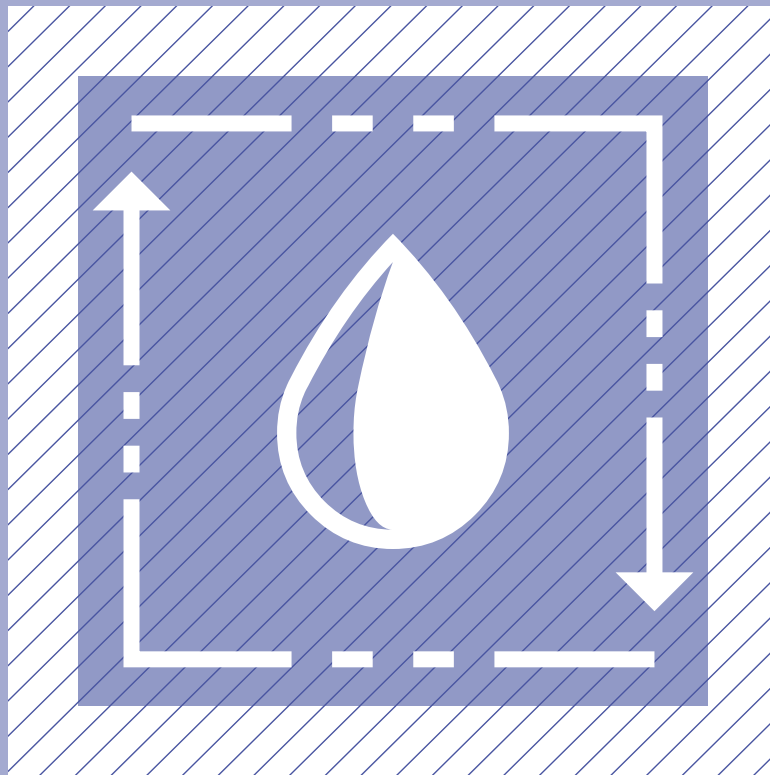
loading to the Point Loma Wastewater Treatment Plant will be reduced. This diversion of flows to the plant will have a direct beneficial effect on overall plant discharge into the Pacific Ocean.

Phase 1 will cost approximately \$1.5 billion for planning, design and construction. Two Water Infrastructure Finance and Innovation

The fact that the water will be locally produced is significant because currently San Diego imports as much as 90% of its water

Act (WIFIA) loans from the U.S. EPA are providing funding for up to \$733.5 million toward the Phase I projects. Additional funding for the construction is from Clean Water and Drinking Water State Revolving Fund loans in the amount of \$665.1 million and more than \$80 million in federal and state grants. The City will also receive a \$340 credit from the Metropolitan Water District of Southern California for every acre-foot of water produced in the Pure Water Program for 25 years. This corresponds to a credit of \$285.6 million over the life of the agreement. The costs for Phase 2 are being prepared, but the City will look for similar financial assistance.

Once fully operational, Pure Water will allow San Diego to better endure drought conditions and become a more sustainable city.





FEATURE

THE EVOLUTION IN MANAGEMENT OF CORROSION, ODOUR AND SAFETY IN SEWER NETWORKS

*FROM IMPROVING COMMUNICATION
EFFICIENCY TO TACKLING OPERATIONAL,
SAFETY AND ENVIRONMENTAL CHALLENGES*

Managing ESG (Environmental, Social and Governance) concerns continues to become more complex for water utilities. Aging infrastructure, reduced operating budgets and increasingly stringent environmental policy make it more difficult each year to meet, let alone improve safety, environmental and operational benchmarks.



CHAIM KOLOMINSKAS, MANAGER OF EVS WATER AT ENVIROSUITE

Environmental management is traditionally considered a cost to doing business. Although many organisations are driven to improve environmental performance, it can be difficult to justify investment for initiatives that have only environmental benefits.

The concept of delivering both environmental and operational benefits is not new. Eco-efficiency, cleaner production and industrial symbiosis have been around for decades as ideas. The key proposition behind these concepts is that you can have your cake and eat it too. It is possible, with the right idea, to deliver both operational and environmental improvement. Yet, these initiatives often fail to take hold.

The disconnect between environmental and operational benefit

The groups driving environmental improvement and those making operational and strategic decisions for the business tend to be very different. Environmental management has its basis in fundamental science or engineering, with dedicated subject matter experts leading the understanding of the issue. Measuring, assessing, and describing the significance of any particular issue is complicated. We are usually trying to represent an environmental system accurately enough to understand whether an activity is causing a problem, or importantly, whether it will cause a problem in the future. Modelling of these systems, whether it be some aspect of the water cycle, air quality, noise, groundwater is critical, but each of these disciplines requires its own specialist expertise. Whether that expertise is internal or external to the organisation, it is fundamentally different to the operational and strategic

functions within an organisation that decide how an operation should run.

Communication is the key to driving business-wide value – the start of Envirosuite's SeweX journey

I believe that one of the critical factors that determine whether an organisation can deliver both environmental and operational performance is communication. Historically, the burden has fallen upon the shoulders of key decision-makers or environmental decision-makers who can sell a concept internally.

Today, environmental technology presents an incredible opportunity to bridge the gap between environmental and operational drivers in a business.

When Envirosuite first entered into an agreement with Uniquet (the commercialisation company of The University of Queensland) to commercialise the SeweX modelling product in late 2019, we saw enormous potential in making sewer modelling more accessible to water utilities by digitalising and simplifying this process.

Based on our experience developing other environmental technologies, we identified two objectives during the commercialisation process:

- ★ First, develop modelled outputs that decision-makers can understand quickly and easily.

- ★ And secondly, automatically assess, translate and distribute information to the people making operational decisions.

The original focus of commercialisation was related to odour and corrosion issues. Historically, the model had been applied by academics (the same academics who developed the model) to identify hotspots in sewer networks and assess the costs and benefits of potential control technologies. Although valuable, the information took many months to process - and often, the transient issues that were the subject of the investigation had changed or passed. The data had to be interpreted by the people running the model and recorded in a report in a similar way

It is possible to deliver both operational and environmental improvement, yet these initiatives often fail to take hold



Today, environmental technology presents an opportunity to bridge the gap between environmental and operational drivers in a business





We saw enormous potential in making sewer modelling more accessible to water utilities by digitalising and simplifying this process



to how most environmental modelling information is presented.

What if we could process this information faster and make it understood by non-subject matter experts across the business? It could deliver enormous value across the organisation. For example:

- ★Operational staff could, within hours, understand the root cause of a potential odour issue and take action.
- ★Tactical planning units could quickly assess options for chemical dosing in response to unexpected odour issues.
- ★Potential corrosion issues could be identified before they occur, saving millions of dollars of costly repair work and enormous disruption when assets fail.

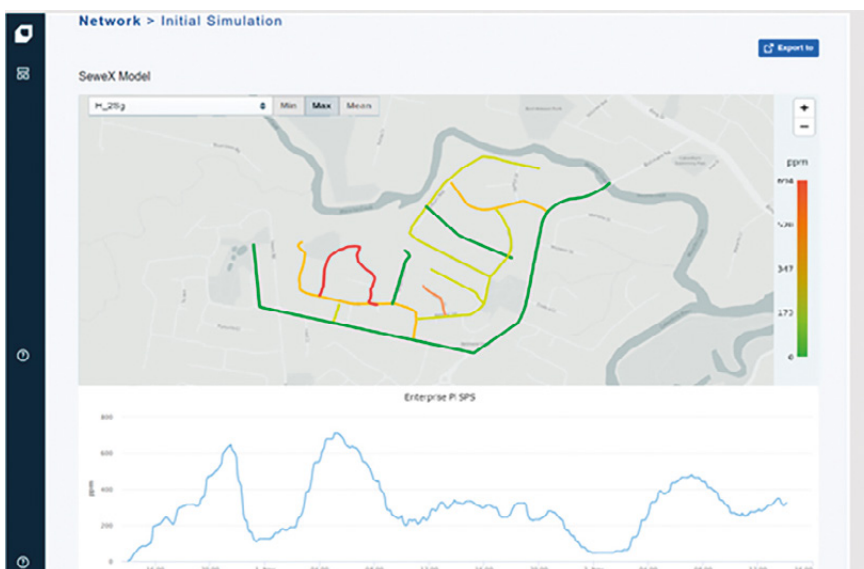
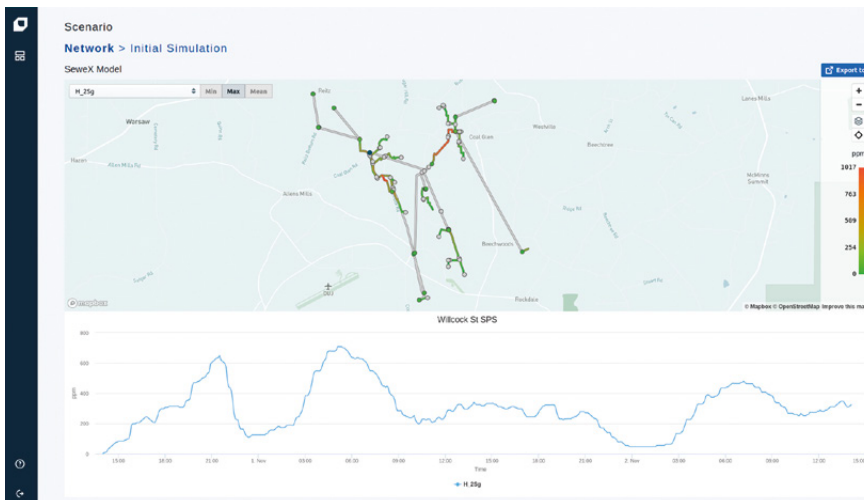
These ideas were tested during early consultation with potential customers when fundamental product design decisions were made. The key objectives of the commercialisation process were validated and engaging with water utilities during the design process helped enormously in working out the detail of exactly how this should be done.

Helping water utilities and operators tackle safety and climate change challenges

When we commercialised SeweX, it was clear that the technology delivered valuable additional insights by using information that is already routinely collected by water utilities. This was an important factor in developing automatic upload of hydraulic modelling and laboratory analysis of water quality information.

In 2021, when we engaged with our first commercial customers, SeweX's applicability to managing safety and climate change objectives was also tested.

Methane, a key output of SeweX, fills in an important gap in the knowledge of sewer network operators. Safety management related to methane generation is currently focussed on personal



monitoring at the location where work is done. SeweX is unique in that it predicts methane generation across the entire network and can deliver a valuable understanding of where methane related risks might be occurring. Along similar lines, this can also help utilities understand greenhouse gas emissions in sewer networks - a historically underappreciated part of the water industry's emissions inventory.

This early engagement also led to innovations in how different risks related to the sewer network are evaluated and compared, and outputs that could be more easily communicated and used within a typical risk management framework.

Allowing utilities to operate more efficiently and make capital expen-

diture decisions with certainty and confidence

Although sewer overflows and energy optimisation are receiving some attention from water utilities, the focus on corrosion, odour and safety related to methane and sulphide generation is still traditionally very much based on costly manual measurement approaches. Subsequently, only a small proportion of the network is assessed each year. Furthermore, decisions on major capital budgets are still based on many assumptions and are taken with a high level of uncertainty. Therefore, delivering more certainty into this process can only help utilities drive efficiencies in operations and capital planning.

SeweX started as a way to fundamentally improve the understanding of corrosion, odour and safety in sewer

networks. Since then, it has proven to play an important role in helping utilities approach their ESG objectives. EnviroSuite's journey is underway and will continue to evolve as we collaborate with water utilities and operators around the world.

*If you'd like to learn about our products and collaborations to date, go to our **website** or contact Chaim Kolominskas, Manager of EVS Water.*

The focus on corrosion, odour and safety related to methane and sulphide generation is still very much based on costly manual measurement



DR PANG CHEE MENG

CHIEF ENGINEERING AND TECHNOLOGY OFFICER, PUB

“Managing water demand is as important as securing an adequate supply of water”

Singapore is recognised worldwide as a forward-thinking city and a model for integrated water management. Faced with the constraints of limited land and natural water resources, it recognised as early as the 1960s that a sustainable water supply was key to becoming one of the world's most advanced metropolises.

 CRISTINA NOVO PÉREZ

Singapore's National Water Agency, PUB, has successfully closed the “water loop” and manages the whole water cycle, from rainwater collection, purification and supply of drinking water to wastewater treatment and reclamation to produce NEWater, the country's brand of recycled water. PUB has led a successful journey to meet the nation's water needs with investments in research and technology to treat, recycle and supply water in an integrated, effective and cost-efficient manner. In this interview, we hear from Dr Pang Chee Meng, Chief Engineering and Technology Officer of PUB, about the water reuse developments and policies that have made this success story possible.

Can you briefly tell us about your career path and your current role at PUB?

As Chief Engineering and Technology Officer at Singapore's National Water Agency PUB, I lead PUB's Technology Department to drive our research and programmes for the development and application of new water technologies in the entire water cycle.

Prior to my current role, I have experience in wastewater treatment and water-policy development, having served as the General Manager of the Jurong Water Reclamation Plant and a stint at the then-Ministry of the Environment and Water Resources. Between 2011 and 2012, I was also actively involved in the development of water-related standards in Singapore and various international subcommittees that developed new ISO standards for water reuse.

Later, I led the Industry Development team at PUB to formulate and implement strategies to grow the Singapore

water industry and facilitate the commercialisation of new water technologies.

How has water reuse technology and policy evolved in recent years? Is there still room for improvement?

Singapore is a highly urbanised and dense city, with limited land to store and collect all the water we need. The government started exploring water reuse as early as the 1970s and commissioned a study to determine the feasibility of producing reclaimed water. While it was technically possible, there were concerns surrounding the reliability and high cost of the technology then.

By the 1990s, membrane technology's cost and performance had improved considerably. Other countries such as the United States were also increasingly using it for water treatment and reclamation.

There was a stigma against water reuse due to misperceptions surrounding its water quality. At PUB, we learnt from leading examples of water reuse and in 1998, set up a team to test the latest proven membrane technology for water reclamation. Two years later, we commissioned a full-scale demonstration plant that could produce 10,000 cubic metres daily. The ultra-clean, high-grade reclaimed water was named NEWater and its quality is well within the WHO and USEPA's requirements for drinking water.

Water reuse has been implemented in Singapore since 2003 for indirect potable and non-potable uses. Today, water reuse is generally well accepted and widely practiced, not only in Singapore but in many parts of the world with many reuse projects. For us in Singapore, we believe that we are the first in the world for wafer fabs operators to use NEWater to produce ultra-pure water for their wafer fab production. This industry requires water quality that is more stringent than for drinking.

Technology-wise, we are incorporating membrane bioreactors in our wastewater treatment plants which will deliver better quality NEWater at lower cost, smaller footprint and lower energy. Source con-



trol is key, and we have tightened our monitoring and enforcement of industries through regulations to ensure our treated effluent is good for NEWater production. Monitoring systems and sensors are installed in factories of concern to ensure compliance with discharge standards and proper disposal of their waste.

Singapore is successfully closing the water loop by recycling used water. Does PUB plan to develop the recovery of resources from used water?

We are actively pursuing resource circularity to reduce our waste footprint as part of the circular economy. This involves reducing the volume of sludge produced from our water reclamation plants and waterworks, as well as using environmentally friendly products and harnessing co-location synergies.

One example of this is Tuas Nexus – the integration of the Tuas Water Reclamation Plant (Tuas WRP) and the National Environment Agency (NEA)'s Integrated Waste Management Facility (IWMF). This is a sustainable and energy self-sufficient solution meeting Singapore's long-term solid waste management and used water treatment needs.

By employing the latest technologies, Tuas Nexus will harness the synergies of the water-energy-waste nexus from used water and solid waste. The by-product of one facility becomes a resource for the other facility. For example, IWMF's Food Waste Treatment Facility will convert source-segregated food waste into food waste slurry that is suitable for co-digestion with used water sludge at the Tuas WRP. The co-digestion of food waste



and used water sludge will increase biogas production by 40 per cent at the Tuas WRP, compared to biogas yield from the treatment of used water sludge alone. The biogas produced will then be combusted at the IWMF and the combustion heat energy recovered to improve the overall plant thermal efficiency and boost electricity generation. The electricity generated by IWMF will be used to fully power the operations of Tuas Nexus with excess to be exported to the grid.

As the world's first integrated waste and water treatment plant, its completion will prove momentous for Singapore's overall sustainability journey.

In 2021, we also launched a request for proposal to seek innovative solutions and technologies that can recover useful resources such as chemicals in water and used water treatment processes and

minerals (i.e. rare metals) from seawater desalination brine.

Digital is an integral part of Singapore's integrated management approach. What are PUB's plans for further leveraging digital solutions in its operations in the coming years?

PUB has continuously invested in technology to achieve smarter water quality management, network improvements, integrated customer engagements, and smarter work processes. We are always on the lookout for innovative solutions that can make our water operations more effective and energy efficient, and renewable energy is one avenue that we are investing in. Through rigorous research and development (R&D) over the years, we have integrated technology throughout the water loop to optimise our opera-

"We are the first in the world for wafer fabs operators to use NEWater to produce ultra-pure water for their wafer fab production"



Employing the latest technologies, Tuas Nexus will harness the synergies of the water-energy-waste nexus from used water and solid waste

tions – from stormwater management to potable water production; and used water collection and reclamation. We are leveraging more smart technologies and digital solutions in our operations. With sensors, predictive models, automation, and other digital technologies, we can detect and pre-empt problems before they occur.

PUB is also keen to empower customers with near real-time information on their water consumption to encourage behavioural change and good water saving habits. In January 2022, we started installing smart water meters in residential and non-residential premises, which can record customers' water readings automatically several times a day and sends the data via a digital communication network back to PUB wirelessly. The smart water meters are also pivotal in enabling PUB to achieve greater oper-

ational efficiencies. With the daily water usage data, PUB will be able to optimise water production and network management by understanding water demand patterns at different times of the day across various zones. The data collected can also be used to quickly detect and locate potential leaks within the water supply network.

To help users unlock the full benefits of their smart water meters, we have also launched the *MySmartWaterMeter* portal. This is an online portal where users can log in anytime, anywhere to view their daily water usage and even hourly breakdown. There are other useful features on the portal – users can set monthly water goals, receive possible leak alerts in the house, do a comparison with similar household types and get water saving tips.

The Smart Water Meter Programme is an important pillar in PUB's Smart Roadmap, which outlines our vision to digitalise Singapore's entire water system. These and other digitalisation projects will help PUB to become more efficient and productive, in our transition to becoming a smart utility of the future.

Despite its dividends, digitalisation is not always easy or straightforward to implement. In Singapore, PUB works with both the private sector and academia to

commercialise innovations. It co-invests with organisations and opens up some of its facilities for real-world tests, which are isolated from the rest of its network for safety. We believe that water utilities can harness digitalisation in a variety of ways to enhance employees' ability and empower them to perform their duties at work more effectively.

Could you tell us about the use of digital technologies in the area of smarter water quality management with artificial intelligence and automation?

Artificial intelligence has greatly improved the effectiveness and efficiency of our work processes. For example, the Smart Water Grid collects real-time hydraulics and water quality data across Singapore to monitor water quality and pressure. This automated data collection and analysis has streamlined our planning processes to fulfil Singapore's daily water demand.

"We are always on the lookout for innovative solutions that can make our water operations more effective and energy efficient"

Digital technology has also empowered our officers with the means to enhance water quality monitoring while improving productivity. For instance, we have automated the monitoring and detection of micro-invertebrates in treated water, using a smart scalable micro-invertebrate detector system with image analytics capabilities. The previously manual and labor-intensive process is now an automated system which has helped achieve long-term benefits, including annual savings of 550 manhours per plant as compared to manual inspection, and increased monitoring frequency and round-the-clock surveillance.

Singapore's total water demand, which includes non-domestic water sector consumption, is expected to almost double by 2060. What type of policies is being used to encourage circularity by industrial water users?

We encourage water circularity from industrial users through policies and incentives to minimise wastage and maximise the efficiency of water through recycling and reuse.

Under the Mandatory Water Efficiency Management Plan (WEMP), large

non-domestic water users are required to submit their water efficiency management plans to PUB annually and propose water conservation measures for implementation. This helps companies to better understand their water usage patterns and manage their water usage. With the data collected from the plans, PUB develops water efficiency benchmarks and best practice guidelines for the different industries and sectors to share with companies and further help them improve water efficiency.

PUB actively engages the large non-domestic industrial water users (such as those in the Wafer Fabrication and Semiconductor sector, the Refineries, Petrochemicals and Chemicals sector and the Biomedical sector) with the intent of expediting the implementation of innovative water recycling/conservation solutions within their premises.

To help companies mitigate risk and defray the financing gap between R&D and full implementation of innovative technologies, PUB offers both funding and technical support to companies through PUB's Water Efficiency Fund and Industrial Water Solutions Demonstration Fund. In doing so, PUB hopes

to build confidence amongst the industry in novel technologies and expedite the adoption of innovative water solutions in industrial premises which would increase water recycling and conservation.

PUB also organises forums and seminars where companies can share their experiences in implementing water recycling/conservation projects and learn more about emerging technologies for water recycling.

Managing water demand is as important as securing an adequate supply of water. Achieving a sustainable level of water consumption and managing the impact of water on the environment takes the commitment and participation of the community. When firms reduce their water footprint, use alternative water sources such as seawater and maximise their water recovery by reclaiming waste streams, they make every drop of water count and reduce their water costs too.

NEWater is a pillar of Singapore's water sustainability. This success story is not only about technology, but also about public acceptance. What lessons learned along the way would you share with other countries that are getting started on water reuse?



An important part of the NEWater success story is its high public acceptance. But this did not happen overnight. We recognised that the key to a successful water reuse programme is the ability to gain public confidence and acceptance.

Right from the start, we had focused our public communications efforts on the rigorous and robust treatment processes using advanced membrane technologies to produce NEWater, and the benefits of NEWater as a viable source of water. By benchmarking against drinking water guidelines set by the United States Environmental Protection Agency (USEPA) and the World Health Organisation (WHO), it provides reassurance of NEWater's quality.

Before NEWater's launch, we held extensive briefings for all stakeholders such as community leaders, business communities and government agencies to help them understand that NEWater is a safe and sustainable source of water for Singapore. We organised educational tours for the media, bringing them to Europe and the United to learn about their water reuse programs. We also produced a documentary on the technology of NEWater and the water reuse experience of other countries.

A key pillar of our outreach programme is the NEWater Visitor Centre. This was set up in early 2003 to educate visitors about water sustainability in Singapore and how NEWater is produced, through interactive tours and educational workshops.

Water treatment processes are energy intensive. Can you comment on the carbon footprint of the "Four National Taps" (local catchment, imported water, NEWater, desalination) contributing to Singapore's diversified water supply, and the steps PUB is taking to decarbonise its operations?

The production of NEWater and desalinated water are more energy intensive compared to the other two water sources, and these are the areas where



PUB co-invests with organisations and opens up some facilities for real-world tests, isolated from the rest of its network for safety



we hope to source innovative solutions that can fit our operational needs while also contributing to a reduction in our carbon emissions.

PUB aims to achieve net zero carbon emissions by mid-century, and we plan to do so by reducing the energy consumption of PUB's water treatment processes, as well as using more clean, renewable energy in said processes.

To do so, we adopt a three-pronged approach of 'Reduce, Replace, Remove'.

PUB has been working with industries and research institutes to develop and test next-generation membranes that can substantially reduce the energy required for desalination and used water treatment by 50% or more.

Specifically, we aim to halve energy consumption to desalinate seawater. Today, about 3.5 kWh/m³ of energy is expended to convert seawater to drinking water and we aim to reduce the energy required to 2 kWh/m³. Likewise, for NEWater, we aim to reduce the energy consumption by about half through improvements in membranes and improving recovery without additional energy input.

To replace fossil fuels with clean, renewable sources of energy such as solar power, PUB currently harvests some 70 MWp of solar power from both its

land-based (roof top) installations and floating solar photovoltaic (PV) systems. PUB is considering two other large-scale floating solar PV systems at Lower Seletar (100MWp) and Pandan Reservoirs (44MWp) and to do so in an environmentally sensitive manner. With our ongoing R&D efforts, we expect to abate approximately 600 kt CO₂e/year or 60% of total emissions from our water treatment processes by mid-century.

Capturing and removing carbon that we release into the atmosphere is the next big task on hand and is an emerging technology focus area. PUB is already studying new technologies such as carbon capture, utilisation, and storage (CCUS) and carbon removal solutions that can be integrated with our water treatment facilities, to effectively remove the remaining 40% or 400 kt CO₂e/year of emissions.

"Digital technology has empowered our officers with the means to enhance water quality monitoring while improving productivity"

MAXIMISING THE ENERGY

The war in Ukraine has highlighted Europe's dependence on fossil gas from Russia and other sources and provided the impetus for the European Commission to increase biomethane production in the bloc more than ten-fold, from 3 billion cubic metres (bcm) in 2020 to 35 bcm by 2030, a doubling of the previous target. While much of this will be derived from crop and food waste, if the target is to be met, then the wastewater sector will have to maximise its production of biogas.

 **MATT HALE, INTERNATIONAL SALES & MARKETING DIRECTOR, HRS HEAT EXCHANGERS**

Within weeks of Russia's invasion, the European Commission outlined proposals to reduce the EU's dependence on Russian gas by two thirds before the end of 2022 as part of a plan to become independent from all Russian fossil fuels 'well before 2030.' To put this monumental shift in European energy policy into perspective, before the invasion Russian gas accounted for 40% of European gas demand, with imports around 155 bcm per year, although some countries such as Germany are much more dependent on Russian gas than others. That means that new biogas targets would replace some 20% of Russian gas – now biogas supplies just 5% of total European gas demand.

To wean itself of Russian gas, Europe is adopting a multi-faceted approach, including increases in energy efficiency, increasing imports from other sources such as liquified natural gas (LNG) from the United States and Qatar, and increasing domestic production of green renewable gas in the form of biomethane and hydrogen. These steps, and others, were presented by the IEA as a ten-point plan in March to significantly reduce Europe's dependence on Russian gas within 12 months. Although the targeted under the REPowerEU plan increase to 35 bcm of biogas is ambitious, as a target it still falls below the potential 130 bcm of capacity that the IEA suggests is possible.

One of the advantages of ramping up biogas production is that the technology is proven, mature and affordable. While

additional investment is required to upgrade biogas to biomethane, this too uses established technology, and biomethane can be transported and distributed using existing gas infrastructure.

However, there are political concerns over the increased use of energy crop feedstocks (both in terms of direct and indirect competition for food and feed). The war has also seen massive increas-



POTENTIAL OF SEWAGE

es in food commodity prices and crop inputs including fertiliser, fuel and crop protection chemicals. Not only will these cost increases also increase the cost of crop feedstocks for biogas, but any measures which reduce Europe's capacity to produce food (for example by producing biogas feedstock crops including maize, grass and sugar beet) which could further rise food prices will be fiercely resisted by politicians and the public – before any environmental consider-

ations around land use, biodiversity and water use are considered.

Therefore, while crop-fed anaerobic digestion plants will play an important role, all other potential sources of biogas will also need to be explored and utilised, including livestock manures, food waste, green wastes and wastewater treatment.

According to the European Biogas Association (EBA), sewage-fed biogas plants are the second most numerous after farm-based plants, with the Czech

Republic and Scandinavia having particularly strong representation. Overall, the EBA estimates that just under 10% of the total installed biogas electricity capacity of 10,532 MW is from sewage-fed plants.

Many of the first generation of wastewater AD facilities are now looking to upgrade, with many switching from producing electricity to biomethane to take advantage of increased incentives for biomethane production. However, small-scale improvements have been no less important in helping to boost the sector's energy output and upgrading an existing plant is an ideal opportunity to improve its overall efficiency, to maximise both energy production and overall greenhouse gas savings.

This is where smart thinking comes in – not only in terms of adopting the latest adaptive technology and remote monitoring, although these are important – but also in terms of taking a smart approach to the overall energy efficiency of AD facilities. In the United Kingdom, the water sector has been at the heart of AD efficiency and improvements. Between 2010 and 2015, the installed capacity for the anaerobic digestion of sewage sludge in the UK rose 12% to 216 MWe, but wastewater biogas plants actually generated over 25% more power over the same period.

Not only will biogas production need to be maximised, but the efficiency of all



Within weeks of Russia's invasion, the European Commission outlined proposals to reduce the EU's dependence on Russian gas by two thirds



While crop-fed anaerobic digestion plants will play an important role, other sources of biogas will need to be explored and utilised



the associated processes, from feedstock processing to digestate handling will also need to be improved. Recapturing process heat is one of the easiest ways to improve efficiency, and heat exchangers represent the best way of doing this. They are an established technology, but despite their widespread use in industries such as food manufacturing and the chemical sector, they are often under-used in AD plants.

Captured heat can be utilised in the AD process itself, for example to pre-heat feedstock or digesters to improve gas production efficiency, or anywhere else that heat is required; from water treatment, pasteurisation and concentration processes – to office and space heating, or to provide hot water for cleaning.

Using surplus heat in this way is free, without the need to buy additional fuel, and all these applications can be carried out using a suitable heat exchanger. Such an approach may also provide additional

benefits compared to other technologies, such as the tank heating systems often used for pasteurisation. A well-designed system could recover and utilise 40% of the heat produced by the plant.

Heat exchangers resolve efficiency challenges

Using heat exchangers for pasteurisation is more efficient than using tanks with heating jackets as they have a much lower heat requirement; up to half of that of some systems. This is because tank systems have lower heat transfer efficiency and usually dump the hot water after use, rather than reclaiming it. Using heat exchangers means that the effective pasteurisation of digestate is possible using surplus heat rather than needing to install an additional heat source such as a biomass boiler, which could add hundreds of thousands of Euros to project costs.

However, not all heat exchangers are equal, and one size does not fit all – the AD industry covers many different sectors processing a variety of feedstocks from food waste to farm residues, to liquid by-products. One range proving popular with wastewater AD operators across Europe is the DTI series from HRS, which is a double tube heat exchanger. The inner tube is corrugated to ensure improved heat transfer performance and superior resistance against

tube wall fouling, resulting in reduced maintenance periods. In addition, the tube in tube design permits the processing of fluids with particles without any tube blockage, making it particularly suited to sewage AD plants.

But having recovered this valuable heat, what are water companies doing with it? With a typical 1.5 MW wastewater AD plant producing as much as 40,000 tonnes of liquid digestate each year – bringing significant economic and logistical challenges associated with its storage and transportation – many operators are using their surplus heat to improve their digestate management systems. After all, if it isn't concentrated, the volume and consistency of digestate can quickly become a costly bottleneck in plant efficiency.

Using a well-designed heat exchanger system can provide a continuous pasteurisation process that uses less energy than alternative

According to the European Biogas Association (EBA), sewage-fed biogas plants are the second most numerous after farm-based plants



systems, while allowing additional thermal regeneration, or recovery, levels of up to 60%. This saved heat can then be used elsewhere, such as an evaporation plant.

The HRS Digestate Pasteurisation System (DPS) provides continuous pasteurisation, with one tank being pasteurised while one is filling, and another being emptied. The DPS uses a double tube heat exchanger to heat the digestate to 75 °C above the required pasteurisation temperature. This allows for variation in the sludge consistency and its incoming temperature, making sure that the digestate is always properly pasteurised. The tanks can also be used individually, for example for routine maintenance.

Concentrated digestate is easier to manage

Using surplus heat to separate water from digestate by concentration can re-



duce the overall quantity of digestate by as much as 80%, greatly lowering the associated storage and transport costs. A system such as the HRS Digestate Concentration System (DCS) will include

measures to retain the valuable nutrients in the digestate, while the evaporated water can be condensed and returned to the front end of the AD process, reducing the amount of energy and water used by the plant. After concentration, the treated digestate dry solid content can be as much as 20% (often a fourfold improvement), making it much easier, and cheaper, to transport and handle.

Another benefit of the DCS is odour and ammonia control, which helps increase the nutrient content of the digestate. The high temperatures and vacuum conditions needed to concentrate digestate can cause the release of ammonia, largely responsible for the odours associated with digestate. The DCS overcomes this by acid-dosing the digestate with sulphuric acid, thereby decreasing the pH levels. This turns the ammonia into ammonium sulphate, which is not only less odorous, but is also an ideal crop nutrient.

By improving the efficiency of their wastewater AD plants, many of the UK's water companies are enjoying increased return-on-investment helping to make their services more affordable and sustainable; particularly important as the water industry uses around 3% of all the electricity generated in the UK.

*To learn about our products, go to our **website** or email: info@uk.hrs-be.com*





US\$6.15 BILLION PFAS REMEDIATION FORECAST UNDERPINNED BY CHANGING REGULATORY ENVIRONMENT

The U.S. Federal government has taken significant steps to address PFAS, while highly affected states rolled out their own policies



The health risks and contamination associated with per- and polyfluoroalkyl substances (PFAS) are propelling state and federal legislators to crack down on the usage and spread of these “forever” chemicals impacting drinking water supplies. Boosted by an uptick in regulations and funding, drinking water remediation technology spending is forecasted at US\$6.15 billion for this decade, according to a new report from Bluefield Research.

Total annual expenditure for PFAS treatment systems is estimated to scale from US\$334.6 million in 2022 to US\$1.1 billion in 2030. The state-by-state forecast in Bluefield’s report PFAS: Drinking Water Treatment, Regulations, and Remediation Forecasts, 2022–2030 is highly influenced by the extent of PFAS contamination within

each state and the adoption of state and federal policies.

“Without a doubt, PFAS has moved to the forefront of concerns for water utilities and the public at large,” says Lauren Balsamo, a Municipal Water Analyst for Bluefield Research. “This is the first time the federal government is expected to issue PFAS standards as well as dedicated funding to address remediation. At the same time, states continue to adopt their own stringent regulations.”

In only a few years, the U.S. Federal government has taken significant steps to address PFAS contamination, as outlined in the release of the Environmental Protection Agency’s (EPA) PFAS Strategic Roadmap in October of 2021. The EPA is now well underway in setting guidance on these chemicals, including implementing drinking water

maximum contaminant levels (MCLs) by fall 2023. In addition, the recently legislated Infrastructure Investment and Jobs Act (IIJA) includes US\$10 billion devoted specifically to addressing PFAS and other emerging contaminants.

In the previous absence of federal guidance, highly affected U.S. states such as Michigan, New York, and New Jersey already rolled out their own policies. To date, 44 states have legislated policy mechanisms to limit PFAS contamination in drinking water.

California’s forecasted US\$888 million of spend (highest of all states in the U.S.) is driven by the state’s high number of confirmed contamination sites, the state Water Board’s proactive testing for PFAS contamination, and a more rigid regulatory environment. At the same time, New Hampshire, despite its small size, falls into the top 20 spot for remediation spend at US\$59 million, driven mostly by its more advanced regulatory landscape.

Some utilities, particularly smaller ones, may find themselves unable to navigate the financial, operational, and technological hurdles to meet the changing water quality requirements. “Public water systems, including investor-owned, will need to make significant investments to meet existing and impending standards,” says Ms. Balsamo. “Our team is keen to see if looming water quality standards will accelerate utility acquisitions, especially as smaller systems face additional financial pressures to address PFAS,” says Balsamo.

HASSAN ALLAM CONSTRUCTION (HAC) AND VEOLIA COMPLETE WASTEWATER TREATMENT PLANT IN EGYPT

The contract included engineering, procurement, and construction services for the plant, part of the National Rural Sanitation Programme

Hassan Allam Holding has recently announced that its subsidiary, Hassan Allam Construction, as part of a consortium with Veolia, has completed a project which included the design, supply, maintenance, and installation of a 33,000 cubic meter per day sewage treatment plant in Senbellawein, in the Dakahlia governorate of Egypt, northeast of Cairo.

The contract awarded in 2018 included the full engineering, procurement, and construction services for the waste treatment plant, lift stations, and networks,

along with a one-year operation and maintenance period. For the project, the Veolia-Hassan HAC consortium built 85 kilometres of sewerage networks.

The construction of the Senbellawein wastewater treatment plant is part of the National Rural Sanitation Programme (NRSP). Implemented by the Egyptian Ministry of Housing, Utilities and Urban Communities (MHUUC), the programme seeks to extend sanitation services to more than 30,000 small villages across Egypt cur-



rently unserved by the existing sanitation network.

According to The World Bank, only 18% of households in rural areas in Egypt are connected to sanitation services. To increase sanitation services, in 2015, Egyptian authorities developed a performance-based subsidy scheme for local water and sanitation companies when it was launched in 2015. Through this programme, the Egyptian government recorded the connection of 167,000 rural households to sanitation networks in 2018.

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NEW FINDINGS ENABLE MONITORING FOR HARMFUL TOXIN IN FRESHWATER ENVIRONMENTS

Researchers have identified the genes involved in biosynthesis of guanitoxin, a neurotoxin produced by some harmful algal blooms



An international team of scientists has identified the genes and the biosynthetic pathway that enable certain types of cyanobacteria found in freshwater environments to produce a potent neurotoxin called guanitoxin.

Harmful algal blooms, often involving toxin-producing cyanobacteria, are affecting lakes, rivers, and other freshwater bodies with increasing frequency. Environmental monitoring programs can detect most of the cyanobacterial toxins, but the unusual chemistry of guanitoxin makes it incompatible with standard detection methods.

Understanding the genetic basis for guanitoxin biosynthesis means that molecular diagnostic technologies can now be used for environmental monitoring to detect the presence of guanitoxin-producing cyanobacteria.

The new findings, published May 18 in the *Journal of the American Chemical Society*, include evidence that guanitoxin is likely present in many lakes and reservoirs in North and South America. Guanitoxin has the same mechanism of action as the nerve agent sarin and the banned pesticide parathion, causing acute neurological toxicity that can lead to rapid death. Exposure to it has been associated with the deaths of wild and domestic animals.

“Now that we’ve found the genes and have biochemically linked them to the production of guanitoxin, we hope that we can use PCR-based detection technologies to predict future toxicity and environmentally monitor this toxin,” said Shaun McKinnie, assistant professor of chemistry and biochemistry at UC Santa Cruz and

one of three corresponding authors of the paper.

The other corresponding authors are Marli Fiore at the University of São Paulo, Brazil, and Bradley Moore at Scripps Institution of Oceanography at UC San Diego. Fiore’s lab isolated a guanitoxin-producing strain of cyanobacteria almost 20 years ago from the Tapacurá reservoir in eastern Brazil. After sequencing the strain’s genome, the Brazilian researchers — led by Stella Lima, then a graduate student in Fiore’s lab — found a cluster of genes they suspected were involved in guanitoxin production.

Lima, who is the first author of the new paper, went to UC San Diego in 2018 to work with Moore, who had done the first biochemical studies of guanitoxin in the 1990s. McKinnie got involved in the project as a postdoctoral researcher in Moore’s lab. When he moved to UC Santa Cruz in 2019, his lab continued to work on the guanitoxin biosynthetic pathway in collaboration with the other two labs. Graduate student Jennifer Cordoza led the effort at UC Santa Cruz.

“The whole lab helped contribute to this story, however, Jenny ran with it and validated over half of the pathway herself during the first year of her Ph.D.,” McKinnie said. “We’ve now identified all nine of the enzymes involved in how this organism takes the amino acid arginine and converts it into a specialized toxin.”

The researchers confirmed their findings by reconstituting the guanitoxin biosynthetic pathway “in vitro” (in the test tube, without cyanobacteria).

**TOM HOMAN FREE**

NATIONAL SALES MANAGER AT PROMINENT FLUID CONTROLS SA

RETHINKING WATER DISINFECTION STRATEGIES, IS THERE ONE SOLUTION FOR ALL?

In deciding on a water disinfection strategy there is always a tug of war between the customer end goal, which is restrained by budget and water specifications, and the disinfection strategy chosen, restrained by contaminants, water source and infrastructure.

With the current conditions in the global market for freight and raw materials, I see more and more customers and colleagues in the water industry experiencing challenges in treating water. These challenges can come in many forms from public pools in England running out of chlorine to disinfect pool water, to municipalities in South Africa where the infrastructure has gotten so bad that the water is contaminated after it leaves the treatment station.

Most of the time, these problems come up as short term problems which can be resolved by using a more expensive alternative treatment or bending the rules for “one” time. But what if these problems take longer to resolve, what if borders remain closed for longer periods as we have seen during the COVID19 pandemic where trucks with water treatment chemicals were stuck at borders across Southern Africa.

Let’s take some of the major threats to providing safe and disinfected water, aging infrastructure, availability of chemicals, safety issues, emerging contaminants, budget, and operating safety concerns. If we take all of these into consideration when choosing a disinfectant, it would be great to have the one universal solution (spoiler: I would not be sitting in an office if I had this solution). If we have a look at common methods used, we quickly find that there are pros and cons to all of them that restrain the use or the effectiveness for different challenges.

Chlorine is still globally the most used disinfectant because it has a good disinfection strength and is cost-effective in most cases. But with the rise in fuel cost and sometimes just not being available in the form that we are used to (liquid or gas

form) we might have to look at alternative ways to use chlorine either by producing on-site or using this in solid form. Still looking at possible long-term effects from disinfection by-products, different disinfection methods might be a better option.

If we look at ozone, it does not have the drawbacks of chlorine, we just need air and electricity to make one of the most powerful disinfectants available to us. But because ozone is so reactive it’s also short-lived and cannot, therefore, disinfect large networks of pipes. Add to this the technology that requires high-level knowledge to operate and maintain and we quickly see that this is not ideal for a lot of situations.

Ultraviolet light would be a better candidate then? The only thing needed is power and depending on the flow to be treated it’s not that much. With UV disinfection there is no residual effect but also no residual disinfection making it an excellent gatekeeper for point-of-use disinfection but less suited to provide large networks with water disinfection. It is a robust method that requires very little intervention from operators and the investment cost is low.

Chlorine dioxide is a powerful disinfectant which is usually generated on-site; it actively removes biofilm and in low concentrations has no taste or smell to it. This might be the ideal disinfectant with its good residual value and a small percentage of by-products. The drawback would be that we still need chemical precursors to produce chlorine dioxide and there is still an addition of chemicals to water which might cause harmful effects in the long term.

Unfortunately, there is no one ready-made on the shelf solution for solving water disinfection challenges. Only by looking at the source of the challenge and having a clear understanding of the end-use for this water can we overcome these challenges. Whether you are filling a hotel pool in Mauritius or providing potable water for a rural village in Ghana the disinfection strategy will always have to be a vital part of that plan.

If we look at common methods used, there are pros and cons to all of them that restrain the use or effectiveness for different challenges

WASTEWATER TREATMENT FOR A CRITICAL AIRPORT

When a leading utilities and services provider was commissioned to create an environmentally-critical application for one of the world's busiest airports, they collaborated with water-treatment expert SEKO for a failsafe solution.

The European airport handles in excess of 80 million passengers each year, and among the huge number of logistical challenges management faces in order to ensure the safe and efficient operation is managing the effect of cold weather on aircraft.

Large-scale de-icing avoids flight cancellations

During winter, the presence of snow and ice disrupts airflow over wings and the tail of an aircraft, hindering its ability to create lift and consequently preventing pilots from taking off.

In order to avoid the delay or cancellation of potentially hundreds of flights and the subsequent disruption to travellers, the airport invested in de-icing cannons in order to spray airliners with a heated glycol fluid. This process ensured that settled snow and ice melted, while preventing further build-up once planes were airborne.

A commitment to minimizing environmental impact

However, the airport was concerned that wastewater from this process



TREATMENT SOLUTION PORT APPLICATION

could contaminate waterways with glycol, having a devastating effect on surrounding waterborne wildlife. With up to 1,000 litres of de-icer required to clear an Airbus A380, and hundreds of flights departing daily, the pollution risk was significant.

The airport, having a clear vision for sustainable growth, had worked hard for many years to reduce its environmental impact, meaning any contamination incident would be a significant setback with the resulting negative publicity damaging its public profile.

Airport management, therefore, commissioned a leading utilities provider to build and operate treatment works adjacent to the site in order to improve the quality of wastewater being discharged.

When designing the plant, the utilities company decided to treat the wastewater via a flocculation process, whereby contaminated particles in liquid clump together and eventually sink, allowing them to be separated and the remaining clean water safely discharged.

Looking for a proven solution capable of handling this complex and demanding process, water-treatment dosing and control specialist SEKO was approached to supply an automated polymer batching system that could separate pollutants and allow treated water to be safely discharged into a nearby watercourse.

Following an extensive assessment of the site and application, SEKO recommended its PolyCendos polymer



preparation unit (PPU) in order to automatically dose up to 200 litres of wastewater per second with flocculant.

Safety, reliability and performance in one

PolyCendos is an all-in-one system for the preparation of polymer solutions, supplied complete with an IP65-rated

The airport, having a clear vision for sustainable growth, had worked hard for many years to reduce its environmental impact



SEKO supplied an automated polymer batching system that could separate pollutants and allow treated water to be safely discharged

electric control panel, dosing pumps and powder feeder.

The unit has three chambers for dissolving, maturing and storage which are interconnected by syphons, forming a perfect flow necessary for the formation of a high-quality solution. The chambers include inspection covers and emptying valves and are made entirely

in PPH for excellent chemical resistance and a low-friction surface.

PolyCendos' comprehensive safety features include a safety pressure switch for the automatic water supply system, an emergency stop for all components and a separate safety level switch for overflow levels.

How PolyCendos works

1. Operators tip powdered polymer into a hopper from 20 kg bags, ensuring compliance with manual handling regulations. When the level of prepared solution falls below the minimum level, an alarm indicates that the powder tank must be replenished.
 2. The powdered polymer enters the system via a stainless-steel batching screw – managed by a precise speed regulator – and mixes with water before the resulting solution drops into tank one below and the dissolving phase begins. A customized stainless-steel agitator slowly and continuously turns the contents of the tank, ensuring thorough homogenization of the solution.
 3. The siphon transfers the solution to the maturing chamber, where another slow agitator keeps the mixture uniform until maturing is complete.
 4. The solution is transferred to a storage chamber from where it can be transferred for use. When this tank is full, the powder dosing pump automatically stops and the water inlet is closed, preventing further solution from being batched.
 5. Two motor-driven PS2 Spring series pumps dose the polymer solution into the wastewater, with flow-rate adjustment performed automatically by an Aktua control unit, which can be calibrated during operation for maximum efficiency.
- Meanwhile, SEKO also supplied its Spring pumps coupled with Elektra digital controllers for the precise dosing of anti foam – commonly required in wastewater processes. Elektra's revolutionary 'data on demand' technology

meant users could control anti-foam dosing from any location via PC, laptop or smart device.

Because some of the client's site management operated multiple plants and were not always present at the airport, being able to remotely view and adjust dosage was a huge benefit. With this comprehensive water-treatment system in place, airport management could guarantee the quality of its discharged water, protect local wildlife and enhance its drive towards sustainable growth.

Another example of a SEKO solution helping customers achieve long-term, cost-effective improvements in their daily operations.



**With this water-treatment system,
airport management could guarantee
the quality of its discharged water
and protect local wildlife**





THE JOURDAIN PROGRAMME

VENDÉE, FRANCE, WILL TREAT WASTEWATER FOR INDIRECT POTABLE WATER USE



© Atelier RVL Architectes – Tours

The Jourdain programme, unprecedented in Europe, will treat wastewater to provide a source of drinking water. It will be built in the Vendée, an area on the Atlantic coast of France under water stress in the summer months which relies heavily on surface water for its water supply, to help address the risks of future water shortages.

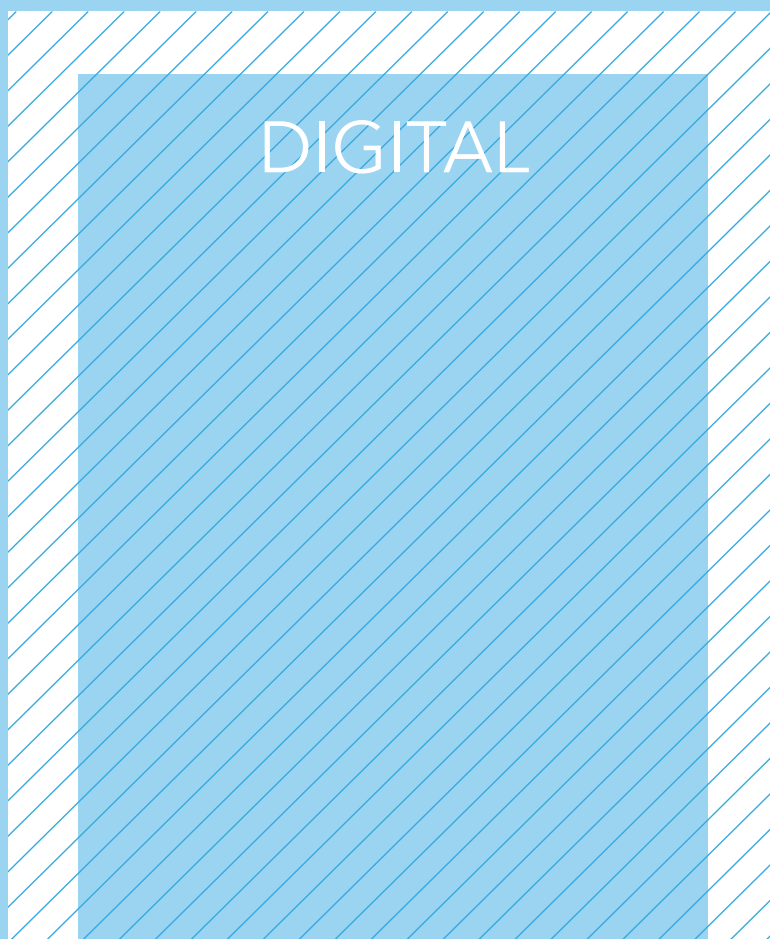
The programme is being implemented by local water authority Vendée Eau, and has a total budget of 19.5 million euros for 10 years.

The project involves the construction of a refining plant, launched in July 2021, for which Veolia's REUT (Reuse of Treated Wastewater) solution was chosen after a public procurement procedure. This plant will use ultrafiltration and low-pressure reverse osmosis to further treat the

effluent of the Les Sables d'Olonne wastewater treatment plant. Key in this process is Veolia's Barrel technology, a low-pressure reverse osmosis vessel that contains 200 membrane elements.

The water will then be transported 25 km to the Jaunay dam, and released into a vegetated area to slowly make its way to the reservoir. The cycle will close when reservoir water enters the local drinking water production facility and is distributed to users.

The Jourdain programme will ensure a reliable source of drinking water in the future, while at the same time it will reduce the environmental footprint of water services in the area. A pioneering initiative that will put the circular water economy in action.



NO PLAN B

RESILIENT ORGANIZATIONS AND DIGITAL SMART ATTITUDES MITIGATE RISKS IN WATER SAFETY AND SUSTAINABILITY

 SANDRA DiMATTEO. INDUSTRY MARKETING DIRECTOR, WATER INFRASTRUCTURE AT BENTLEY SYSTEMS

Water safety and sustainability are more fragile than we think. There is no plan B when it comes to water goals, and failure is not an option. If we are to achieve the UN SDG 6, which is clean water and sanitation for all by 2030, much more needs to be done. But access to potable water is one of the most challenging issues that the world faces — from India's looming water crisis, with rural areas so desperate for access to clean water; to the subtropical area in Brazil, where they face the worst water crisis in nearly 30 years; to threatening droughts in water scarce regions in the western United States.

If we are to combat climate change and its impacts, as in SDG 13, we need to work smarter to become more resilient leveraging digital solutions to speed up our actions and make the changes sustainable. Climate change has triggered many unplanned rainfall events that wreak havoc with water resource and utility operations, leaving communities vulnerable to water supply disruption or worse.

Digital solutions help to speed up delivery of water to people in need

In India, the government is also looking for ways to have clean water available across the country, particularly in small rural villages. In the almost 400 villages of Khatan in the state of Uttar Pradesh, approximately one and a half million people struggle on a daily basis to access clean water. In these villages, many women walk several kilometers each day to fetch water preventing them from earning a living. They often take their children on the long trek, preventing them from attending school and obtaining a good education. Water is the top priority of these villages.

Uttar Pradesh State Water and Sanitation is improving the state's water infrastructure with a mission to bring drinking water to every household. The Khatan Group of Villages Water Supply Scheme was awarded to Larsen & Toubro Construction. The project includes designing and constructing an intake well to collect water from the Yamuna River, as well as an approach

Water professionals worldwide are helping to bring safe and secure supply to water-scarce areas. Engineers are simulating and evaluating scenarios, searching for optimized solutions to combat the effects of climate change to drive solid contingency plans for seasonal droughts, which are becoming more severe.



bridge that connects to a water treatment plant, 40 intermediate booster pumping stations, 121 elevated storage tanks to distribute the water through a 1,531-kilometer pipeline network, and a 2,129-kilometer distribution pipeline network that serves the community. Larsen & Toubro Construction needed to provide a complete solution, from concept to commissioning, that extends into 10 years of operation and maintenance for what will be an integrated smart water system.

There were many engineering challenges, magnified by a very tight timeline. Within six months, the team had to generate 890 BIM models for 200 different structures, all considering various soil interactions. The design of the water supply system proved to be a significant challenge, so the team turned to Bentley software to help determine the best and most economical design.

Using OpenFlows WaterGEMS, the engineering team rapidly designed the network, putting them ahead of sched-

ule. With the help of STAAD.Pro, the team was able to quickly design the structural foundations for the treatment facility, elevated storage tanks, and other structures, allowing the design work to be completed 30% faster than they would have using manual methods. They used PLAXIS to secure the safety of the work area, determining safe excavation sloping and saving time and money. The engineering design phase was thankfully ahead of schedule saving two precious months due to digitalization.

Enabling access to water for the community, and completing this project faster, will have enormous value for the local households, food, culture, health, education, economics, as well as the integrity of the natural environment. The project will enable 1.5 million people to achieve sustainable health through quality drinking water. From improving access to education to enabling women to earn a wage instead of fetching water, this social commitment is impacting the quality of life in this area.

Structures in the Khatan Group of Villages Water Supply Scheme (Photo courtesy of Larsen and Toubro)



Woman in India fetching water on a daily basis.

A contingency plan to ensure supply in the event of drought

After a severe water crisis, over 100 municipalities in Brazil declared a state of emergency, and rationing and supply rotation went into effect. This water crisis triggered engineers in the city of Joinville to develop contingency plans to maintain the water supply during drought conditions. Preliminary simulations produced water shortages, so they sought a more comprehensive network study. They used Bentley applications to create a digital twin and perform hydraulic analysis of the dis-

**To combat climate change,
we need to work smarter
to become more resilient,
leveraging digital solutions to
speed up our actions**



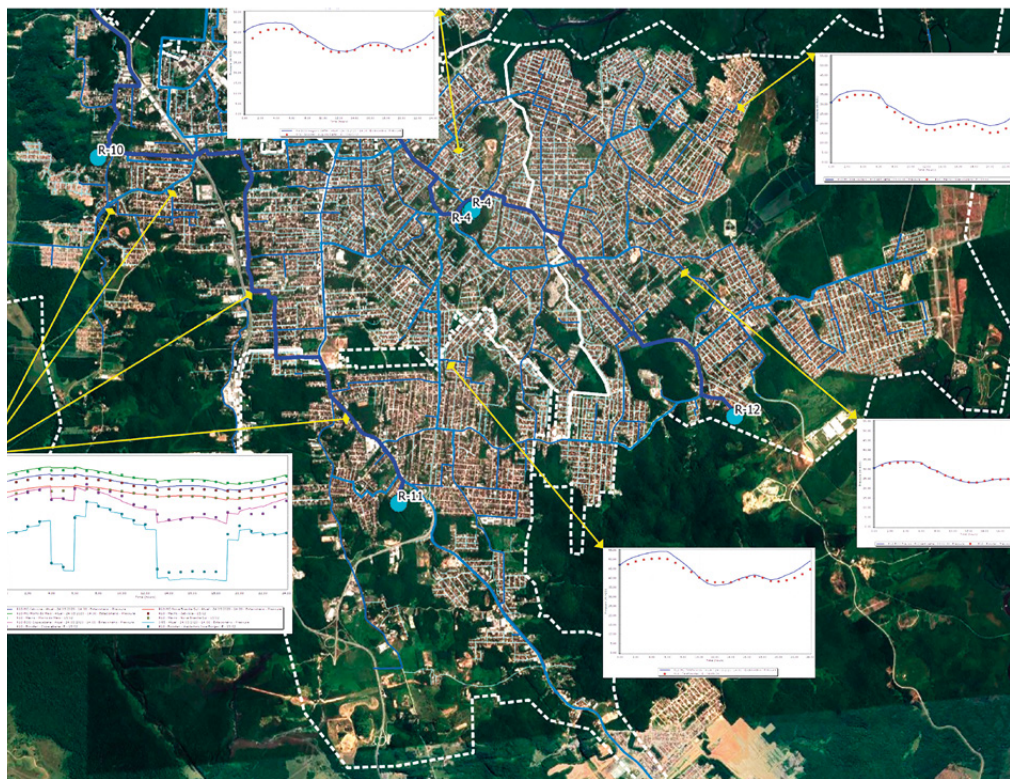
Engineers in the city of Joinville used Bentley applications to create a digital twin and perform a hydraulic analysis of the system

tribution system, guaranteeing water supply while saving BRL 4.5 million as a result of maximizing operational performance and efficiency. Technology enabled this innovative solution and gave residents peace of mind.

Preparation for rapid response to climate events

When Hurricane Ida released intense rainfall over the Commonwealth of Pennsylvania, New Jersey, and New York, real-time data and automated analysis triggered immediate alerts and notifications to key engineers and the authorities. The complete and self-sustaining Dam Safety Monitoring Solution uses a network of sensors to monitor conditions ranging from rainfall, pore pressure, deformation, reservoir lake level, and other metrics to provide automated site-specific insights on the condition of the dam and water distribution system.

In the case of Hurricane Ida, such data was used to establish alerts that triggered notifications that were autonomously sent to key engineers and authorities when thresholds (or predefined warning limits) were exceeded. Bentley's sensemetrics infrastructure IoT solution helped to alert the counties to conduct evacuations in a timely matter when multiple dam sites lost power. Through use of real time automated monitoring, the Dam Safety Officer was able to address the rapidly deteriorating conditions that nearly reached overtopping conditions and maintained an enhanced safety response for the surrounding areas.



Complexity and interdependency between systems are managed through the digital twin (Photo courtesy of Companhia Águas de Joinville).

Groundwater supply to vulnerable communities

Water supplies are under pressure and over utilized so surface water is an easy water source for people to see, develop, and manage. But groundwater is invisible. This hidden resource is, therefore, much more difficult to regulate and manage. That is where groundwater models are key to bringing water to vulnerable communities faster than ever before.

In a South Sudan refugee camp, the Groundwater Relief organization used Bentley's Seequent Leapfrog models to create a 3D groundwater model to better understand the geological profile of the camp. The model helped the engineers to discover additional water resources, a deeper system, and a shallow system, right beneath their feet.

Accelerating the timeline on Sustainability Goals for Water



The Larsen & Toubro project demonstrates the importance of accelerating access to clean water. The UN SDG 6 established this lofty universal call to action as part of the 17 sustainability goals agreed upon by the United Nations General Assembly in 2015 to achieve a better and more sustainable future for all by the year 2030. SDG 6 is to ensure availability and sustainable management of clean water and sanitation for all. It encompasses six outcome-oriented targets, including safe and affordable drinking water and improving water quality.

But globally, we need more. We are making good progress with Bentley and Larsen & Toubro working together to accelerate the delivery of water supply to the communities of India. However, it is estimated overall globally that by 2025, the number of people that will live in water-scarce regions due to growing drought issues caused by climate

change and population growth will in fact increase, not decrease. In many places we will be in a worse position than we were in 2015 when the goal was established. More people will have difficulty accessing a clean, safe water supply on a daily basis. And by 2050, more than half the world's population

could be living in water-stressed regions due to the impact of climate change and droughts, urbanization as well as conflict and war.

Water safety and sustainability are more fragile than we think. There is no plan B when it comes to water goals, and failure is not an option. We are all part of the solution and digital will help us get there faster. Sustainability means rethinking how we do things, and doing things smarter and with greater transparency. Collaborating with stakeholders in a connected digital twin environment will help us learn from the past, make better decisions today, and create a better future for all.

At Bentley, our mission is to provide innovative software and services for the enterprises and professionals who design, build, and operate the world's infrastructure – advancing both the global economy and the environment for improved quality of life. Connecting the entire water cycle, engineering firms trust Bentley software to accelerate the design and construction phase, then once in operation, utilities can optimize the smart and resilient water system to avoid supply interruptions, ensure compliance to regulations, and mitigate risks. Partnering for success to digitalize the water project and asset lifecycle, Bentley and its users are leading the way to the digital water future.





OVARRO POLLUTION EARLY-WARNING TECHNOLOGY CHOSEN BY ANGLIAN WATER

Anglian Water's investment in BurstDetect proves its commitment to reducing pollution by adopting innovative solutions



Anglian Water has become the first utility to adopt new cloud-based technology to detect rising main sewer bursts. In a world-first, the UK utility is implementing early-warning system BurstDetect from technology company Ovarro, as part of its drive to eliminate serious pollution events in its region by 2025.

Through a dashboard, BurstDetect provides an overview of system status together with current and historical burst alerts. If data suggests a potential burst, an alert is sent to control rooms for early response. Such early action can prevent the escape of sewage and resulting environmental damage, ensuring companies fulfil their environmental obligations and avoid fines, regulatory penalties and prosecutions, and long-term reputational damage.

George Heywood, analytics innovation lead for Ovarro, said: "We are proud that Anglian Water has become the first utility to implement BurstDetect as part of its pollution prevention strategy."

"Rising main sewers pose a unique challenge to water companies. The pumped wastewater they convey can have a catastrophic ecological impact in the event of a burst, causing major disruption to customers, resulting in expensive tankering and clean-up operations and serious reputational damage - such events are just not acceptable in the eyes of customers and regulators."

"By being the first utility to invest in BurstDetect, Anglian Water is leading the way, proving its commitment to cutting pollutions by embracing innovation."

Claire Moore, head of water recycling networks at Anglian Water, said: "With

'zero sewage pollution' as one of our 12 ambitious business goals, we have committed to eliminating serious pollutions by 2025, and to reducing the number of less significant incidents by at least 45 per cent."

"Working with the supply chain to develop innovation and adopt new solutions will revolutionise our ability to meet these goals. Implementing BurstDetect will enable us to respond rapidly should a rising main burst occur, and take proactive action to prevent pollution and protect the environment."

BurstDetect uses unique algorithms to detect bursts using existing data from wastewater pumping stations. The technology can be applied to nearly all pumping stations and requires no additional hardware, with the aim of achieving 100% coverage in networks being monitored.

The system accepts data at a range of monitoring frequencies with algorithms being applied to understand and characterise 'normal' pumping station behaviour. This training and testing approach to machine learning is becoming increasingly important to water companies, giving them more actionable insight than ever before, utilising data that may not have been fully harnessed otherwise.

While this is Anglian Water's first purchase of a wastewater management solution from Ovarro, the two organisations have worked in partnership to reduce leakage for many years, with the utility installing Ovarro acoustic loggers across its network of water mains.

IDRICA LAUNCHES NEW SOLUTIONS AND EXPANDS GOAIGUA PLATFORM TO CATER FOR OTHER AREAS OF WATER CYCLE

The multinational specializing in smart water is expanding its solutions to include urban irrigation, agriculture and river basins

Idrica has developed new software solutions for the optimization of the entire water cycle, increasing its outreach to new areas. These solutions are part of its GoAigua platform and broaden its portfolio to sustainably address the main global challenges in the management of this precious resource. The new range of solutions will enable Idrica to break into new markets as part of its international expansion plan.

The new solutions help to define optimal irrigation plans and automate the

watering process in landscaped spaces, an area in which water reuse and energy efficiency are key. Thanks to the GoAigua Smart Green solution, cities can centrally control irrigation in their parks and gardens, adapting it to the needs of each green area and its terrain.

In the agricultural sector, GoAigua AgroTwin centralizes control over infrastructure, billing, collection, and field-work monitoring. The solution helps irrigation associations to view the key indicators of their activities from a cen-



tralized, single management point and to detect possible leaks, fraud and consumption in excess of the set allocations from an early stage.

Finally, Idrica has added the GoAigua EWS early warning system to its portfolio to improve the management of extreme events in river basins. The solution integrates hydrometeorological sensor networks and the results of hydrological and weather models for the basin, including the simulation of reservoir inflows, to trigger warnings and alarms in real-time.

THE WATER INDUSTRY'S FIRST DIGITAL TWIN READINESS GUIDE TO AID UTILITY TRANSFORMATION

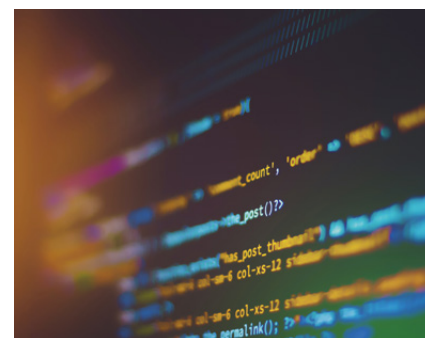
New zero-cost resource provides steps, recommendations, and case studies to achieve efficient and optimized utilities

A diverse group of global utilities, solution providers, academia, and thought leaders have developed a groundbreaking Digital Twin Readiness Guide, the first-of-its-kind roadmap for Digital Twin implementation to advance the water industry.

Spearheaded by the SWAN Forum, Brown and Caldwell, DHI, and with contributions from numerous partners, the zero-cost guide was launched at the SWAN Annual Conference in May. The guide applies SWAN's state-of-the-art Digital Twin architecture, the water in-

dustry standard for planning and implementing Digital Twins.

The SWAN Digital Twin Utility Advisory Group, with representatives from Global Omnium, Sydney Water, Aarhus Vand, Clean Water Services, and DC Water, hailed the guide's potential: "As leading utilities, we believe the SWAN Digital Twin Readiness Guide can transform the water sector by enabling utilities and the industry to understand the foundation of a Digital Twin as they embark on or continue their implementation journey."



While Digital Twin implementation is unique to each utility, deployment steps are foundational to achieving optimized, cost-efficient water systems. Digital Twin readiness is scalable, iterative, and likely phased over time, depending on the utility's unique needs, budget, infrastructure, and software requirements.

The Digital Twin Readiness Guide provides the framework, steps, and path to achieve essential insights leading to more intuitive water systems operations, making the utility more efficient.



MONITORING AND EFFICIENCY IN SMART CITIES

In the near future, water sector stakeholders will be facing major challenges, including the ageing of infrastructure and energy and water shortages, among others. To deal with them, ACCIONA is increasingly embracing the concept of smart water.

 ADRIÁN CAMPOS, DEPARTMENT OF AUTOMATION AND CONTROL

A challenge

All stakeholders in the water sector - particularly water infrastructure managers - face major challenges in the coming years. In Spain, according to the 15th Drinking Water Supply and Sanitation Assessment carried out by AEAS-AGA, which estimated the water supply network in the country to be 224,673 kilometres (4.7 metres of pipe per inhabitant), 39% of the network as-



sets are more than 30 years old, 19% are between 20 and 30 years old, 26% are 10-20 years old, and only 17% are less than 10 years old.

In addition to the above-mentioned ageing of the network, the following is a list of the main challenges facing ACCIONA over the next few years; our services will:

- ★ Proactively manage the ageing of our infrastructure.
- ★ Effectively manage energy and water shortages.

ACCIONA is moving towards the concept of smart water, driven by technologies such as Big Data, IoT, robotics, cloud computing and AI

- ★ Guarantee quality throughout the entire cycle.
- ★ Comply with regulatory requirements in a sustainable manner.
- ★ Put citizens at the centre of our priorities, creatively meeting their expectations and surprising them.

To this end, ACCIONA is moving steadily towards the concept of smart water, driven by technologies such as Big Data, IoT, robotics, cloud computing and artificial intelligence.

A custom-made suit

At ACCIONA we have been repeating almost like a mantra that Industry 5.0 is the industrial revolution of people. This notion is at the core of all our innovation-related developments. Digitalization is now for the people:

- ★ For operators, enabling optimized and efficient management.
- ★ For service managers, providing them predictive models.
- ★ For area managers, by centralizing transactional data.
- ★ For management, enabling the visualization of indicators.

Our way of working has a direct impact on Business Development, expanding our bidding capacity and increasing our brand presence, is aligned with the company's digital transformation strategy, integrates different urban services and is inspired by the concept of sustainability.

We believe that the distribution of data throughout the company should be tailored to each of the roles, so that each person has the information they need when they need it. To this end, considering the broad assortment of indicators that we generate, we allocate them ad-hoc:

- ★ Country, zone: consolidated indicators related to performance or turnover.
- ★ Service: indicators related to the network, meters or service debt.
- ★ District metered area: indicators related to flow rates, leak detection tools or event detection.

One of the recent projects that illustrate this methodology is the digitalization of ACCIONA's Drinking Water Supply and Sewerage Service in Andratx (island of Mallorca, Spain). To control household consumption in the entire fleet, 6,646 static metering sensors have been installed to detect leaks or anomalous events in real-time with maximum precision. The integration of these readings with multiple data sources such as remote control and geographic information systems, commercial management or maintenance, among others, allows the service to use Artificial Intelligence models to maximize its efficiency, putting the end user at the centre of our priorities. For all these reasons, the Andratx Water Service is already a strategic project reference in the digital transformation of our business.

Another exemplary project is SmartWaterLights, which involves the implementation of a smart city in the town of Toro (province of Zamora, Spain), where we have installed IoT sensors belonging to different ACCIONA business lines (domestic water meters in 4 district metered areas, public lighting, fleet of municipal vehicles, waste recycling service). For their monitoring and subsequent integration, we have deployed a LoRaWAN communications network (bidirectional low power consumption wireless technology). Since its implementation, important benefits have been achieved, such as the early detection of events, the resolution of leaks and breaks in less time, the identification and reduction of anomalous consumption and better planning of operation and maintenance tasks. This

Data distribution throughout the company should be tailored to each role, so that each person has what they need when they need it



SmartWaterLights is an example of how working with aggregated information helps detect events in advance and supports decision making

project is yet another example of how working with aggregated information helps us to detect events in advance and supports decision making.

A path forward

Could we identify what are the criteria that establish the need, in the immediate future, to invest in smart water cities? Personally, I have been talking for many years with water sector stakeholders from different countries (and continents!) and I can confirm that there are many models that allow defining the returns of smart water cities. I also

consider it necessary to point out that, although at very specific moments the bibliography may include slight conceptual disagreements, all these analysts agree emphatically that:

★ On the one hand, we find the so-called direct economic criteria, derived from sustained technological evolution and the progress that enables to, for example, reduce water losses or reduce OPEX.

★ On the other hand, there are the intangible economic criteria; these, because they are less straightforward, are my favourite. They are framed within what we know as disruptive technologies; from them, we derive intangible cost savings brought about by Artificial Intelligence, the use of synergies, customer loyalty, commercial reasons or the Sustainable Development Goals themselves.

In numerous books and interviews, Naval Ravikant (a renowned entrepreneur, investor and in my opinion one





From talking with water sector stakeholders, I can confirm that there are many models to define the returns of smart water cities



of the great thinkers of our time) has put into words an idea that, in my opinion, has been hanging over smart water management since its inception: "The difficult part of any technological journey is not the ability to learn, but to unlearn". As a team progresses through a smart water project - and thus climbs

the mountain of knowledge - the sunk cost feeling becomes stronger. This makes it increasingly difficult to identify what might not be the right mountain to climb and make the wise decision to return to base camp. The difficulty lies in having a beginner's mindset throughout the entire project.



WHY SMART WATER SHOULD USE LOW POWER

The modernization of utility networks is one of the largest infrastructure projects of the 21st century. There's no more valuable resource in the world than water, and innovations in water metering technologies allow electronic measurement of not only consumption, but detailed data that can be used to preserve the precious resource, and more rapidly address leaks.

Managing utilities has always been a hassle, with staff dispatched on foot to manually read water meters -- a time consuming and massive logistical effort. Advances in telemetry solutions have helped utility companies remotely read meters from short distances. But because the range is limited to only a few meters, these solutions still take considerable manpower, fuel and vehicle maintenance costs.

You can't manage what you can't measure

Old meters allowed utility companies to collect periodical readings, providing limited data usable for developing insights. Today's state-of-the-art sensors deliver a continuous stream of real-time information with all sorts of metrics on consumption. This data allows util-

Today's state-of-the-art sensors deliver a continuous stream of real-time information with all sorts of metrics on consumption



ity managers to engage in preventative maintenance and solve problems before they become larger and more costly. The information is stored on a secure, reliable cloud-based network, accessible through web-based dashboards and customizable reports that make data gathering and analysis simple and efficient.

Selecting the ideal communication technology

Data from these meters need to be processed into actionable insights, but first must be transmitted directly from the sensors to the provider's management platform in the cloud -- requiring powerful tech infrastructure. Sensors for water metering are usually installed within a building infrastructure or underground. A reliable technology is necessary, one that can penetrate through walls over long distances. But that's only one part

of the puzzle: sensors need power to operate. Battery is preferable to electricity, because it's a massive undertaking to send external power to every meter. But relying on battery requires sensors that last for years, or the hassle of annual meter readings is merely replaced by the hassle of annual battery replacements.

Building the ideal network infrastructure

Companies and municipalities have traditionally setup their own communications network based on Low Range

1NCE entered the market with a simple pricing model: a one-time fee for connectivity that usually lasts over the lifetime of a sensor

METERING CELLULAR RADIO

Wide Area Network (LoRaWAN) technologies. They reach far, easily penetrate walls, and are designed for low power consumption. One of the main reasons to choose these license-free solutions is to independently enable private networks that can be deployed everywhere. There's no external operator needed, no extra fees, nor costly long-term contracts. But to get that data delivered from the device to the cloud, a LoRaWAN network requires dedicated gateways. Additional hardware means additional complexity for setup and maintenance, and higher costs. All that's needed is to get data from the meters to the cloud, but utility managers have built their own network infrastructure -- distracts from the core business of delivering utilities. It makes no sense to become your own telecommunications provider, but that's how it's been done.

Cellular technologies are becoming attractive

Complex pricing structures by cellular network operators made integrating the costs of connectivity into metering products unattractive. But times have changed. Germany-based 1NCE entered the market in 2017 with a uniquely simple pricing model: a one-time fee for connectivity that usually lasts over the entire lifetime of a sensor.

It's not only price saved for utility managers that can skip the costly private networks, but also flexibility. By supporting all possible cellular technologies -- 2G, 3G, 4G, and especially

low power technologies LTE-M or NB-IoT -- 1NCE opens new opportunities for smart metering and every other element of smart cities: pre-paid cellular connectivity that integrates the costs of connectivity into the final price of the device. Supporting the best available technology for each project makes the private network obsolete, at least for utility managers.

Low power connectivity makes more sense than "classic" 3G/4G/5G cellular connectivity for smart metering. LTE-M or NB-IoT deliver strong signal penetration, perfect for use in buildings, or even underground. Bandwidth is limited, but metering sensors don't send video files with big data usage like a mobile phone. They send a tiny fraction of the data and don't need high bandwidth, so low power connectivity saves a ton of energy. Devices can easily run 5 to 10 years without battery replacement. And on the design side, low power connectivity means modules are cheap, often offered for as low as €10 and fully equipped with various sensors.

More than just connectivity

1NCE is the only provider of connectivity and software for IoT at a global flat rate -- offering fast, secure, and reliable cellular connectivity and software services in 140+ countries. For only €10 for 10 years, customers can deploy, connect, and manage sensors across the globe. The connectivity offering is simple: enough data, for as little as a Euro per year per device, to run a water meter over its en-



Next Generation Water Metering: The MacR6N is one example of an industrial data logger, adapted for the toughest environmental conditions. Built by Poland-based metering specialist PLUM, it works independently for years via low-bandwidth cellular connectivity delivered by 1NCE.

tire estimated lifetime. It's a highly scalable solution for smart utilities.

But 1NCE also offers ready-to-use and adaptable software tools that solve typical challenges faced with every type of smart metering project. Talk to 1NCE not only when you need connectivity, but also when you're about to develop your own metering device.

See more at: www.1nce.com

1NCE also offers ready-to-use and adaptable software tools that solve typical challenges faced with every type of smart metering project

CINDY WALLIS-LAGE & ZEYNEP ERDAL

EXECUTIVE DIRECTOR OF SUSTAINABILITY AND RESILIENCE - DIRECTOR OF
INTEGRATED SOLUTIONS AND CAPABILITIES AT BLACK & VEATCH



CHANGE IS OUR ONLY SUSTAINABLE OPTION

How often do you hear someone define insanity as, “Doing the same things over and over again yet expecting a different outcome”? We might laugh about it, but the reality is that as a society we seem to live this way. And the water sector is no outlier.

For decades, we have implemented solutions built upon historical processes and insights – part-assumed and part-deduced – that addressed weather patterns, hydrology, urban planning and population dynamics. We have used “*tried and historically true*” metrics to guide us on what to build and when to build it. And while we trickle in new technology, the design philosophies and infrastructure we build remains starkly similar to what we built following the adoption of the Safe Drinking Water Act and the Clean Water Act in the early 1970s. Yet, the conditions are not the same, and history is not a predictor of our future infrastructure needs. Statistically, weather patterns and temperatures have shifted dramatically in the last few decades, and we have passed an inflection point on how we design for the future. We are seeing a new reality in which: (1) increased storm intensity and frequency is causing flooding and costly infrastructure damage across communities; (2) a decrease in snowpack and changing rainfall patterns are limiting long term water supplies in many regions, which can throttle economic growth, reduce food production, and inhibit hydropower capacity; and (3) increased heat waves escalate water usage and energy requirements and adversely impact crop yields. We have uncovered the insanity of using history to predict future needs despite a new reality, and yet expecting different outcomes.

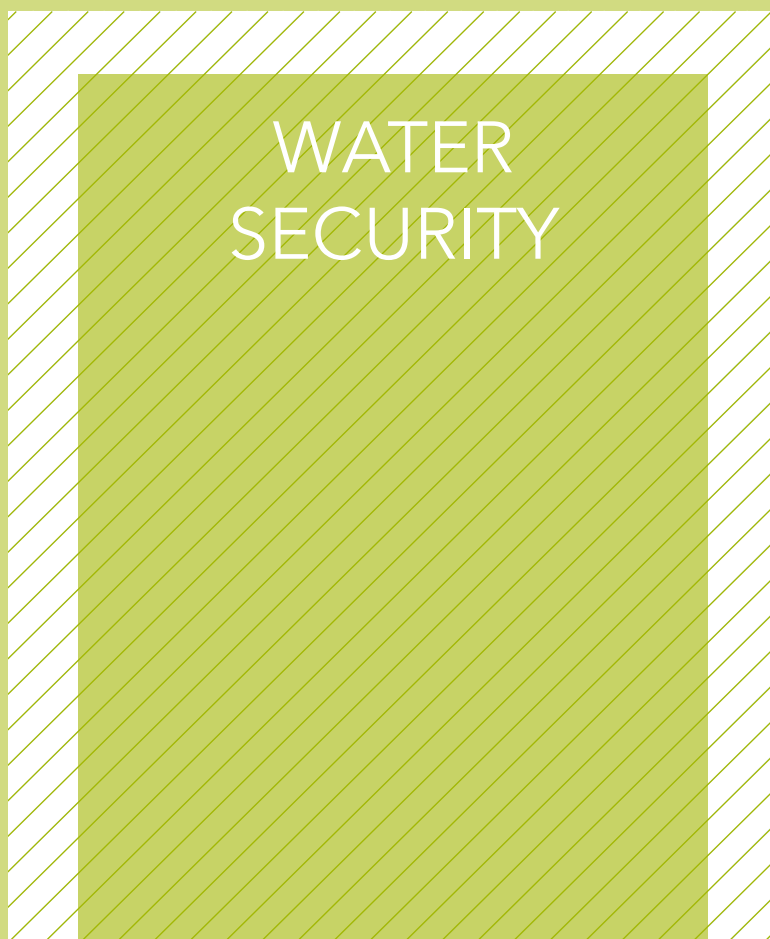
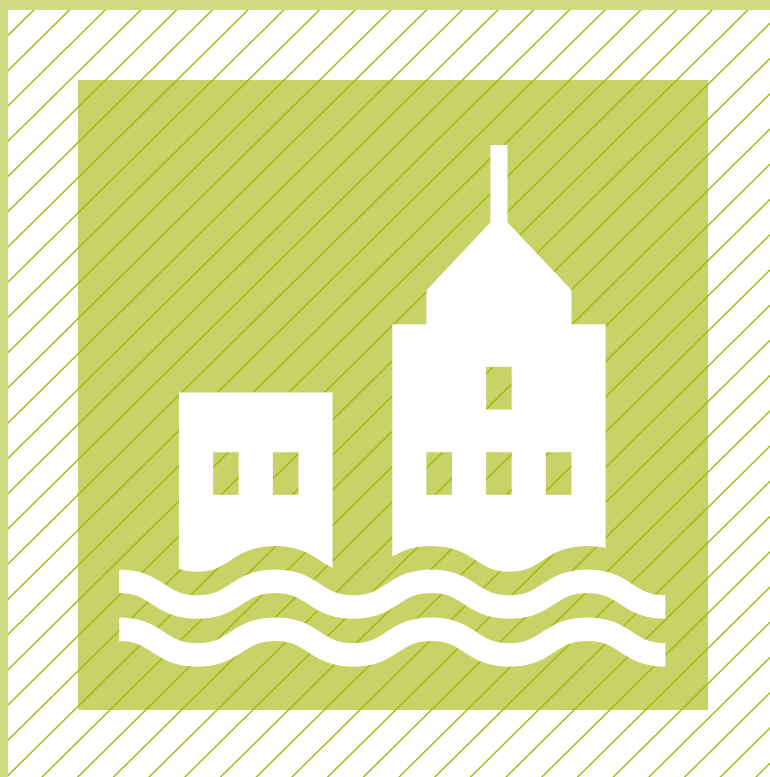
We are witnessing difficult times that demand a stark choice: continue with the same ways, or be bold, take action and address our changing world with a different mindset. In truth, the choice should not be that difficult to make. We are at a moment when change is our only sustainable option. No more

waiting for tomorrow, no waiting for someone else, no singular solution thinking. We are the ones that must act now, act together and act with urgency. Key to our actions is adopting a mindset of doing better and doing more to make resilient, sustainable and desirable communities that facilitate growth, but with less carbon, less water and less degradation of our natural systems. Every day we don’t act is a lost opportunity to make a change and protect the future: a future of economic development, thriving communities, and environmental equity.

To break out of the “insanity,” we must build forward by embracing innovation and change, hold fast to priorities that address climate change, and accept that tomorrow’s water infrastructure won’t look like yesterday or even today. Our pathway requires holistic thinking that will (1) reduce the water sector’s carbon footprint via implementation of energy-efficient technologies and nature-based solutions in combination with greater conservation, reduced leakage and increased data analytics, (2) use less water by valuing and reusing every drop through greater adoption of reuse and greater capture of stormwater to expand water supplies, (3) integrate green infrastructure solutions to restore natural systems and enhance community amenities, (4) implement responsible desalination in balance with conservation, water loss prevention and reuse, and (5) enable environmental and social equity for all community members.

Taking a systems-thinking approach affords every community the opportunity to replace aging infrastructure with solutions that address the changing conditions of today and drive a more sustainable future. Some solutions will deliver incremental change, some will create disruptive change - both are needed. It is critical to adopt a new mindset in our planning and design, to implement the critical infrastructure needed to secure the quality of life for future generations. We must change our pathway today: tomorrow is too late.

We have uncovered the insanity of using history to predict future needs despite a new reality, and yet expecting different outcomes





PHOTOGRAPHED BY OVIESOFT

DR GRACE OLUWASANYA

 CRISTINA NOVO PÉREZ

INSTITUTE FOR WATER, ENVIRONMENT AND HEALTH, UNITED NATIONS UNIVERSITY

"Both physical and economic water scarcity affect the African continent, calling for different approaches"

The United Nations' notion of water security includes different needs and conditions, including water for drinking, economic activity and ecosystems, but also protection from pollution and water-related disasters, governance, financing and political stability.

The United Nations University Institute for Water, Environment and Health (UNU-INWEH) recently released the UN's first assessment of water security in Africa. While limited by poor data availability, the assessment found that levels of water security in Africa overall are low, with little progress over the past three to five years; only 29 African nations made some progress, while 25 made none. The assessment aims to be a starting point for discussions with national, regional and international agents, to help generate policy recommendations and inform decision-making and public-private investments. We talked with lead author Dr Grace Oluwasanya, Senior Researcher and Project Lead of Water, Climate and Gender at UNU-INWEH, to learn more about it.

A Professor of Water Resources Management (Water Safety and Health) with over 20 years in academia, research, and consultancy in Sub-Saharan Africa, the Netherlands, Spain, and the United Kingdom, Dr Oluwasanya's knowledge of water resources spans a broad range of

water issues at different scales. She has extensive research experience focusing on drinking-water safety, water systems risk analysis, water quality monitoring, sustainable nature-based solutions for water treatment, water security, solutions for data-scarce areas, and gender analysis in the water-climate interface. Presently she focuses on the quantification of water-gender interlinkages for greater inclusivity.

The preliminary assessment of water security in Africa found that data availability is very poor. What needs to be done to change this and what are your expectations for improvement in the near future?

The water data gap in Africa is, predominantly, due to a lack of investment in primary water data monitoring, infrastructure, and data-sharing at national levels. What needs to be done may include:

- ★ Deliberate investment in primary data capturing on key water security indicators such as more gauging stations on rivers to capture water quality

data, installation of ground meteorological stations, and more water infrastructure (wastewater treatment/water storage facilities).

- ★ Utilization of remote sensing techniques (e.g., satellite imagery) to build secondary water databases.

- ★ Strengthen institutional capacities in data monitoring, mining, evaluation, and reporting.

- ★ Reinforcing implementation of data sharing policies.

What is expected is, on one hand, immediate action by national governments with support from international agencies to radically improve data collection efforts in Africa, and, on the

"This is an opportunity to deliberately target the collection of sex-disaggregated data for a water security assessment"



The poor state of water security in Africa is exacerbated with global changes like the pandemic, economic crisis, and climate change



other hand, the inclusion of 'Water Data availability' as an indicator for future water security assessments.

Since data collection efforts have to be enhanced, would this be an opportunity to ensure there is a disaggregation of data by gender?

A key challenge with aggregated data is that it masks important differences between the cisgender male and female population. Over the past two decades, there have been global calls to action for gender-inclusive data collection. So, this is an opportunity to deliberately target the collection of sex-disaggregat-

ed data for a water security assessment, and to achieve the global call.

The results of the assessment are appalling: water security in Africa overall is unacceptably low, plus there has been little progress in water security in most African states over the past three to five years. Has the pandemic and subsequent economic crisis dampened progress, or is this part of a long-standing trend of little progress that is difficult to change?

The poor state of water security in Africa is, generally, due to a long-standing trend of poverty and economic fragility, political instability, and poor governance. However, the status and meagre progress is exacerbated even more with global changes like the ongoing pandemic, subsequent economic crisis, and climate change.

Africa's urban areas are quickly growing. Do you expect this rapid urbanization to impact water security?

The core aspect of rapid urbanization is the fast-growing population amidst poor urban planning, pollution, poverty, and competing demands for resources, all contributing to water stress; urban water consumption is expected to double by 2025. Our study shows that while progress in sanitation coverage (an important water security indicator) increased by 3.3% between 2015 and 2020, the population in Africa grew by almost 11% over the same period. With such slow progress and increasing population, Africa will only reach about 67% coverage in sanitation by 2030. Another concern to water security is those sprawling cities located in coastal areas, which are becoming more vulnerable to water-climate disasters such as storms, cyclones, and floods.

Based on your research experience, what could be the role of decentralized water systems to expand access to water and sanitation, and ensuring resilience?

Primarily, decentralized water systems are an effective service delivery expected to provide better access and bring water and sanitation services closer to the users (households). It allows for a more diverse water collection, and decoupling of systems that make water treatment

and delivery more resilient in the face of disasters, shocks, and uncertainties often associated with climate change. Also, it enhances accountability and better water governance as in the case of Kenya's water sector.

Water is unevenly distributed across the African continent. Do physical water scarcity and economic water scarcity (despite high water availability, finance and governance issues limit water access) call for different approaches?

Indeed, both physical and economic water scarcity affect the African continent. These scarcities call for different approaches ranging from advanced technology related to water conservation, improved practices relating to farming (e.g., hydroponics), less use of chemicals in agriculture (impacting scarcity due to better ambient water quality), improved sewage systems, and improved investment in water distribution infrastructure to support clean water initiatives.

Water security is key for food security and economic development. What are your expectations in terms of the water security assessment tool contributing to prioritizing water on the agenda of national governments?

"Decentralized water systems are an effective service delivery expected to provide better access and bring services closer to the users"

The UNU-INWEH Water Security Assessment for Africa is an indicator-based tool aimed to create a quantitative starting point and a platform for discussions with national and regional agents to help prioritize actions, public-private investments, and support decision-making relating to water at the national government level.

Also, we anticipate further engagement with regional and national actors to develop the overall approach and refine the assessment results by continuously testing the methodology in selected countries - to have an improved, influential, and nationally owned water security assessment tool by 2025 (five years before completing the UN's Agenda 2030) and improve how Africa will be ranked on a global scale, given the call for global standards in water security assessment.





PORTABLE DESALINATION PLANTS

TEDAGUA'S
COMMITMENT
TO THE WATER
EMERGENCY IN
THE ISLAND OF
LA PALMA

In response to the water emergency, Tedagua provided two portable desalination plants, located in Puerto Naos, which made it possible, just three weeks after the works had started, to supply irrigation water for the banana plantations in the area, thus minimising the impact of the volcano on the lives of the people of La Palma.

The pandemic, its consequences, and the increase in the price of raw materials were eclipsed for a while by the magnitude of this natural phenomenon. Fascination and helplessness in the face of larger-than-human forces hit us as we watched in the media the evacuations of residents and the material damage caused by the lava flows of the volcano, which have no regard for property boundaries, municipal boundaries or economic interests.

The lava flows directly affected almost 3,000 buildings and 1,220 hectares. In addition, sections of 6 roads were buried, as well as electrical and water networks.

The lava destroyed the water conveyance network that supplies water from

On September 19, 2021, a new volcano erupted in the Cumbre Vieja ridge on the island of La Palma, in the Canary Islands (Spain). Suddenly, the eruption and especially those affected by it were the focus of attention of Spain and much of the world. The lava destroyed the water conveyance network that supplies water from the north of the island to the irrigated area in the south, where most of the island's banana plantations are located.

 **RAÚL FERNÁNDEZ DONADO, HEAD OF ENGINEERING AT TEDAGUA**

the north of the island to the irrigated area in the south, where most of the island's banana plantations are located.

The island's economy relies heavily on agriculture, and specifically on the production of bananas, so the eruption also threatened the livelihoods of many residents. Faced with this fact, at the end of September, the Regional Government of the Canary Islands, with the technical support of the Technology Institute of the Canary Islands (ITC), urgently sought the possibility of immediately implementing a portable seawater desalination plant to produce irrigation water for the banana plantations in the southern part of the island, since the existing water conveyance system had been severed by the volcano's lava. Tedagua responded to this call by offering two containerized desalination plants designed to produce 2,800 m³/day of water each.

Tedagua was founded in 1983 in Gran Canaria, initially dedicated to the construction and operation of containerized desalination plants to supply

The lava destroyed the water conveyance network that supplies water from the north of the island to the irrigated area in the south



the incipient demand of the Canary Islands. In the early years, its activity focused on irrigation and hotel facilities. From Tedagua's workshop in Telde, Gran Canaria, dozens of these plants have been designed and built and continue to be serviced. Tedagua was bought by the Cobra Group in 2001 and its main market changed, moving towards large treatment plants around the globe, with an emphasis on innovation and international clients. Tedagua provides comprehensive water cycle services, from construction to operation, as well as providing services through concession contracts. But at no time have its original activity or facilities been abandoned: they have continued to manufacture plants and provide uninterrupted service throughout almost forty years of history. Tedagua has a portfolio of plants of different capacities that can be manufactured ad hoc or rented for a certain period of time. The

two business lines do not conflict; rather, they have always been understood as complementary. Often the most urgent commissioning projects have been supported by temporary facilities provided by our workshop, or certain industrial plants have been built there as well. On other occasions, central services or site personnel provide support for specific issues in the Canary Islands market. Tedagua has always perceived its workshop and its people as a differentiating element that offers further capabilities to stand out from the competition.

And suddenly, when faced with the request from the Canary Islands Government, everything made even more sense. Immediately, resources were mobilized from the head office and from the Telde workshop to undertake a great challenge: within three weeks we had to be producing water, the banana plantations would not last any longer. And so it was done. It was not simply a question

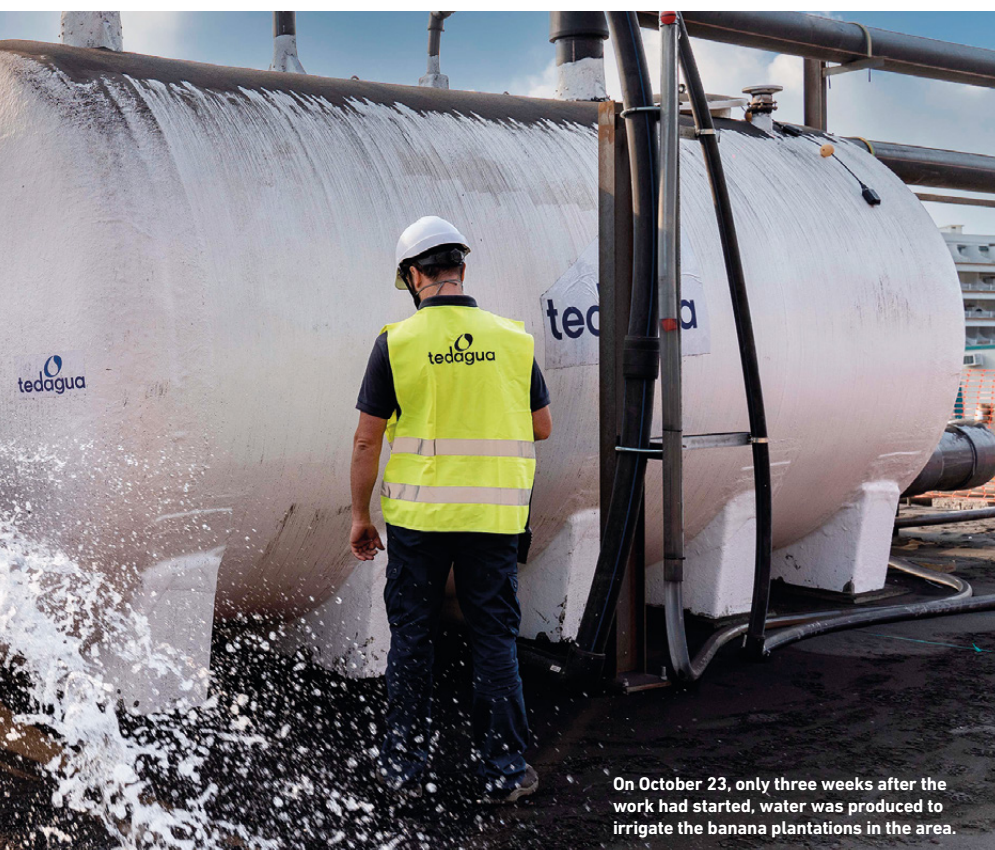
Tedagua has a portfolio of plants of different capacities that can be manufactured ad hoc or rented for a certain period of time

of delivering containerized plants, it also entailed building an intake with beach wells, distribution pipes, storage tanks, a pumping group and the electrical system to feed all of the above, with power supply from the grid.

The work was organized immediately, thanks to the experience and know-how of our staff. The plants were quickly set up in the workshop, while personnel from our central departments went to the site to define, together with the ITC, the Canary Islands Government and the local government all the necessary details for the facilities. The whole company rose to the challenge; it was impossible to manufacture equipment for the plant within those deadlines, so it was necessary to look for it everywhere, searching for all possible options, requiring a great coordination effort.

The location chosen for the plants was Puerto Naos, a beautiful tourist town located to the south of the area affected by the lava flows. The whole town had been previously evacuated by the security forces, since it was within the boundaries of the safety exclusion zone. In order to access the area, you had to have a special authorisation subject to certain controls. Two wells were drilled next to the beach to withdraw the raw water

Tedagua perceives its workshop and staff as a differentiating element that offers further capabilities to stand out from the competition



On October 23, only three weeks after the work had started, water was produced to irrigate the banana plantations in the area.



Military Emergency Unit teams providing support to Tedagua in order to start the works in Puerto Naos.

and convey it to the plants. The osmosis permeate would be stored in a tank and then pumped into the irrigation water distribution network, which operates at high pressure.

While the plants were being commissioned, the government hired the services of a tanker vessel to transport water and convey it through a floating pipeline into the same tank used to store the water produced by the desalination plants. The system was designed and built to accept both sources of water interchangeably. The construction of the tanker's pip-

ing systems to convey the water was also part of the scope of Tedagua's project.

The work was executed flawlessly, relying on our usual subcontractors for assembly, who have been with us on a multitude of projects. As in all our projects, the work was executed with the highest safety standards, in this case even more so, given the logistical difficulties involved. The days were very long, with personnel working as volcanic ash fell from the sky and having to evacuate the site on several occasions due to the risk of lava flows. When they returned to the hotel in the evenings, they had to remove the ash that completely covered them.

The same hotel where the planning and follow-up meetings were held was a temporary home for many families displaced by the volcano. A place of contrasts. Entire families, displaced, without knowing for certain what will happen in the short-term, whose routine has been disturbed without warning, and with no

possibility of going back. Children, who have to play and learn; adults, who have to mourn their losses, wait for help and look for a future... All of them, our staff, the journalists... all brought there by the random fate of a volcano.

Watching the daily news about the eruption, we at Tedagua felt something else, a sense of belonging and a common challenge, even stronger than the one experienced by the country as a whole. We were there, and we were not going to fail.

During those weeks a very strong feeling resurfaced, a sense of purpose as we did our jobs: this is why we are engineers, to provide water where it is needed and to protect the environment. And we never felt alone in this: clients, collaborators, and suppliers were interested in the project and thanked us for our involvement in it.

In order to meet the deadlines, all available resources were mobilized: the

The location chosen for the plants was Puerto Naos, a beautiful tourist town located to the south of the area affected by lava flows

design was made and adjusted. The objective was not to make the ideal plant, it was not to optimize CAPEX or OPEX; rather, it was to build a robust and reliable plant, and to adapt the design to the elements available in the area or accessible in a short time. The bill of materials was cross-checked by engineering with the available stock in the warehouses and went back to the drawing board to adjust it again. Spare parts from other Tedagua plants were rushed to La Palma; stock material was sought from all national suppliers. The logistics department did an excellent job ensuring fast transport to the project site, and we even had a Navy ship transport a centrifugal pump to the area. The objective was clear, and the whole country was supporting La Palma; it was clear that a volcano was not going to defeat us.

And we achieved our objective, indeed. Within three weeks of the order, water was delivered, and the facility has not stopped working since. Likewise, we have not stopped improving and expanding it.

This article does not talk about technical features or innovative materials and technologies (which we also use in other projects). It is about the team experience, that which allows us to adopt innovative solutions because we master the technology. It talks about the flexibility of an organization to adapt to a challenge, which allows us to immediately redirect human and material resources so that we all function as the great team that we are. It speaks of the human dimension of the need for water, of the drama experienced by all the families affected and who still today have not recovered their way of life, despite the fact that other news – inflation, wars – have displaced them from the headlines.

From Tedagua we want to express our gratitude to the Government of the Canary Islands for counting on us, and our utmost solidarity with the affected families in La Palma; it has been a privilege to be able to work with and for them.



The objective was to build a robust and reliable plant, and adapt the design to the elements available or accessible in a short time



Tedagua construction team supervising the progress of the works to provide product water in the shortest possible time.



October 21, 2021: the desalination plants are in their final location and ready for the last production tests.





BARBARA SCHREINER

EXECUTIVE DIRECTOR OF WATER INTEGRITY NETWORK

“We work with partners globally to make sure integrity is on the agenda as an avenue for change”

The Water Integrity Network, currently based in Berlin, supports individuals, organizations and governments promoting water integrity, to reduce corruption and improve the performance of the water sector across the world.

✦ CRISTINA NOVO PÉREZ

The Water Integrity Network (WIN) advocates for measures to strengthen governance processes, manage integrity risks, and keep corruption out, as a key requirement to achieve the global development agenda. WIN's Executive Director Barbara Schreiner has an extensive background in the water sector focusing on natural resource management, poverty and gender issues. In this conversation, she delves into the role of water integrity in the drive for good governance in the water sector.

Can you briefly tell us about your career path and your current role at the Water Integrity Network?

I have been working in the water and natural resource management sector for over 20 years, in the public, private, and non-profit sectors, mostly in my native South Africa. In all my roles, for example as a ministerial advisor or as director of a consultancy, I felt it crucial to focus on good governance and addressing poverty and inequality, including gender-based and other forms of social and economic marginalisation. We can't shy away from the tricky questions and we need to look with honesty at our work and challenges. I believe the water and sanitation sectors can be managed better with integrity,

and they must. That's what I'm pushing for now as Executive Director of WIN, with a view to realising the human rights to water and sanitation.

Water integrity refers to honest, transparent, accountable, and inclusive decision-making by water stakeholders, aiming for equity and sustainability in water management. What trends have you seen in terms of water integrity and corruption in recent years?

For a long time, water integrity was mostly used to refer to water quality. Corruption was a taboo and good governance was another catchphrase without much backing to it. Now, it's different. We see willingness in the sector to discuss systematic issues and there is growing realisation that water and sanitation sector issues are not just technical; that we must look at governance and can't just sweep corruption and integrity failures under the rug. It's no longer anomalous to see accountability mentioned, discussed and supported even if there is still a lot we can do. This is a significant and exciting change for us. We also now see new risks coming in to the picture with the climate crisis, along with a sense of urgency we didn't previously feel as strongly.

At the same time, there have also been some advances in our understanding of corruption and integrity failures and how they affect water and sanitation. It's clearer how we can act and how everyone has a role to play.

Corruption and poor integrity don't grease the wheels of progress, they pull us back: leaving inappropriate infrastructure behind, pumps that break too soon, failed water supply systems, people without adequate water who risk their lives and livelihoods. But we have goals to reach. We can't let integrity issues derail progress on sustainable development and climate resilience or, more importantly, the basic human right to water and sanitation.

Can you tell us about the approach of the Water Integrity Network to improve water sector performance?

"For a long time, water integrity was mostly used to refer to water quality. Corruption was a taboo and good governance was a catchphrase"



Community members proposing solutions to integrity problems related to their water system, using the Integrity Management Toolbox for Small Water Supply Systems, San Lucas Amalinalco, Mexico, November 2020. Photo by Controla Tu Gobierno.

What we do is work with partners globally to make sure integrity is on the agenda as an avenue for change. We raise awareness based on research and the inputs of our network. We then work with sector stakeholders to understand and mitigate practical integrity risks that affect their work at different levels. We're not here to point fingers, we're here to support efforts to minimise risk and encourage change. There are no one-size-fits-all solutions. For example, a utility might use integrity tools as part of non-revenue water reduction programme, minimising possibilities for accepting bribes in

exchange for unregistered connections, making it harder to manipulate records, engaging with communities to better target needs, or ensuring that no conflicts of interest guide who pays and who doesn't.

Do water integrity failures differ depending on the region of the world or other factors such as country income level?

Corruption and integrity failures happen everywhere. Irregular procurement processes, hiring an unqualified friend (for example), deprioritising service upgrades to marginalised areas, even sextortion – where sexual favours are the currency of a bribe, are all integrity failures that could and do happen anywhere. Ultimately, they affect service quality, drain resources, and break down trust. In some places, corruption may just be more open or systematic. In some places, it may be intricate and harder to detect. In some places there is impunity for corruption, making it less risky to engage in.

What characteristics of water and sanitation services contribute to their vulnerability to mismanagement, and how can it be addressed?

Water is a scarce resource, trending towards a natural monopoly, requiring complex technical management and high investment to deliver services. It has many uses and values meaning its governance is generally complex and dispersed across ministries, levels, or constituencies. There are many intermediaries and modalities for service delivery, often informal or unregulated, especially for sanitation, and especially in marginalised areas. These are some factors that make water and sanitation services vulnerable and we're unlikely to eliminate them. What we can do is make corruption harder to engage in, clarify roles and responsibilities, change organisational character to one that is built around integrity and intolerance of corruption and promote open accountability mechanisms.

I'll give a couple examples. By recording meter readings with pens instead of pencils, the risk of manipulating records is reduced; by publishing tariffs clearly the risk that service is discretionary is reduced. These are simple cases, but they show practical steps can be taken.

Generally, we support collaborative approaches which have multiple components for Transparency, Accountability, Participation, and Anti-corruption. In Kenya, for example, our partners are working with the national water services regulator and the Water Sector Trust Fund to apply integrity management tools for service in rural or remote areas where supply systems are generally small. Big efforts were put into clarifying legal management models and responsibilities and also in opening up communication channels between local government and water committees. These have made a difference for service delivery already. With more measures to engage with communities, or even make sure there is a bank account to collect payments rather than

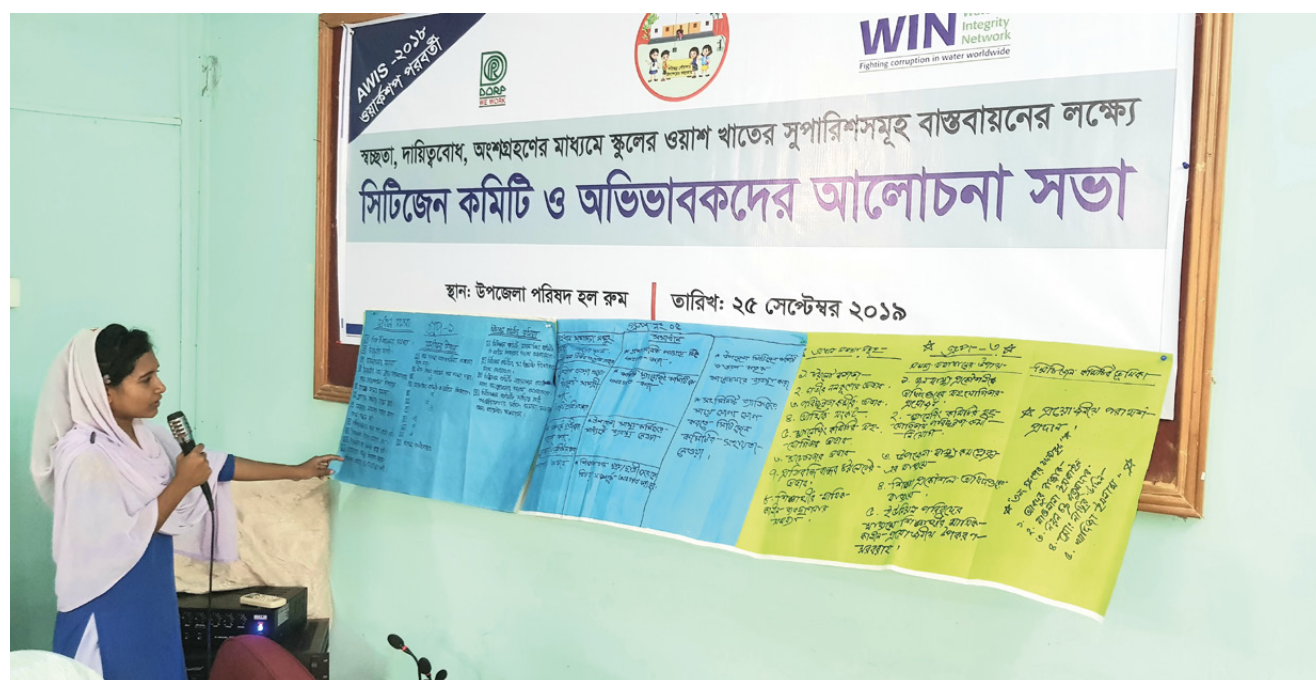
"Corruption and integrity failures happen everywhere; ultimately, they affect service quality, drain resources, and break down trust"

a pocket, service is more transparent and accountable. Each step is important.

Can you comment on integrity issues related to delivery of water services in informal settlements or other excluded communities?

We have looked at integrity failures in informal settlements more closely through research in Kenya and South Africa with SERI, as well as in our latest *Water Integrity Global Outlook*. Many people living in informal settlements pay more for water than wealthier neighbours. Wealthier neighbourhoods receive disproportionately more resources or subsidies for service development.

We're now working with partners to better understand specific integrity risks for service delivery in informal settlements



Student member of school WASH team discussing needs and issues of school WASH facilities at her school, following an assessment and campaign on integrity for school WASH with Bangladeshi partner, DORP. Photo by DORP.

Something obviously isn't right, and this doesn't just concern a few people. Almost half of the people living in cities in Africa live in informal settings, close to a third of city residents in Asia.

What we see is that prejudice or failures in the legal framework, lack of engagement with residents, as well as gaps in

statistics (sometimes intentional, sometimes not) may lead to total or partial exclusion of informal settlements from basic service provision. And the vacuum left behind by inaction to ensure service is a playground for corrupt practices.

We're now working with partners to better understand specific integrity risks

for service delivery in informal settlements and come up with integrity tools for utilities and regulators to address them. We're interviewing more stakeholders and are eager for contributions or collaboration. We welcome your readers to join in the discussion and find solutions!

ALEX MUNG

HEAD OF WATER AND ENVIRONMENTAL RESILIENCE, WORLD ECONOMIC FORUM

REIMAGINING OUR FRESHW

The first half of 2022 presented the world with multiple jarring reminders of how vulnerable and fragile our water systems are. From droughts affecting the United States and France, to sweltering heatwaves gripping India and Pakistan, to devastating floods in South Africa, the humanitarian loss is beyond words, and the economic impacts are far greater reaching and more costly than often accounted for, given our interconnected global supply chains. All of this once again underscores the urgent need to address the systemic issues straining our water resources.

But to make meaningful progress, we need to be grounded in reality and acknowledge that the world has changed. While building a more sustainable and resilient global economy is arguably even more important today, global crises such as the pandemic and Ukraine have significantly strained financial resources and human capital. We need to challenge ourselves to think and act differently.

This is where I am optimistic and hopeful. Water is strategically positioned to help achieve our goals. Water can be the enabler and impact multiplier across topics like climate and energy, food security, restoring nature, creating jobs, and safeguarding our health and wellness.

Water can play an important role – both as a risk and an opportunity – in our climate efforts. As one example, in the drive to decarbonize the mobility sector, the mining of metals needed for the production of batteries for electric vehicles could be disrupted by water insecurity. Electric vehicles commonly use Lithium ion (Li-ion) batteries. Producing lithium requires significant amounts of energy and water and can have considerable environmental impacts. Improperly managed or left unaddressed, this can, in turn, affect local water security with other water users – both in quantity and quality of water – leading to disruptions in the production of batteries. The value at stake and the impact across supply

chains for companies can be significant, and ultimately decarbonization efforts may be compromised. Yet water is still often missing from the conversation and strategies.

As an opportunity, water's intrinsic link to energy and carbon can be a useful lever for over 1000 cities that have pledged to halve emissions by 2030. A recent study by global water technology company Xylem estimated water utilities worldwide account for ~2% of greenhouse gas emissions – the equivalent of the world's shipping industry – and 50% of these emissions can be cut with existing technology at low or no cost. Where much momentum exists to transition the shipping industry, why not a concerted push to help cities reach their net-zero ambitions through the water lens?

Across agriculture, one exciting opportunity in the state of Uttar Pradesh, India, supported by the 2030 Water Resources Group (2030 WRG), will benefit one million rice and sugarcane farmers by targeting the mobilization of \$100 million in private investments by 2025 and help improve farm yields, reduce water and carbon footprints, and increase farmer incomes. The ex-

pected outcome is a 10-fold increase in the area under water-efficient technologies and a 60% reduction in greenhouse gas emissions resulting from flooding of farmers' fields. This is just one example of 2030 WRG's pipeline.

Such integrated approaches open doors to novel ideas for financing and attracting investment into water. Why couldn't a page be taken from the transport sector in Hong Kong where the MTR corporation operates a real estate-transport hub model that delivers excellent transport systems, new and vibrant neighbourhoods, opportunities for small businesses, and conserved natural open space. It works because the government allows MTR to benefit from the property-value increases that typically follow the construction of rail lines and transport hubs. Apply this mod-

**Water can be the enabler
and impact multiplier in climate
and energy, food security,
restoring nature, safeguarding
our health and wellness**

ATER FUTURE



el to green infrastructure and water assets, where utilities and developers could see returns from land value increases. This would create incentives to invest in water bodies and green infrastructure, providing natural storage/drainage solutions to alleviate stress on municipal water infrastructure. It would help rethink the way we plan and build our cities to maximize natural assets that also help cooling effects against urban heat and boost mental health benefits. Such a model would start placing proper value on water and natural assets and provide fresh thinking for the new Global Commission on the Economics of Water tasked to help redefine the way we value and govern water.

These ideas then start to inspire innovation in water – not only technology solutions, but new business models, policies, and financing. Imagine if, through technology, products could be traced back in real-time to watersheds of origin and a company's water stewardship activities. Products associated with "gold standard" water stewardship activities could be eligible for inclusion in a negotiated trade pact where benefits include better access to markets, tax exemptions/credits, or freer movement of imports/exports. For something more grounded, consider the nutrients that can be found in wastewater such as nitrogen, phosphorus and potassium. All are in demand and valued by the agricultural sector. In today's context, Russia is among the top exporters of all three, now severely impacting their availability across the agriculture supply chain. Theoretically, if one could fully recover these nutrients from wastewater, they would meet over 13% of global agricultural demand for them, according to the United Nations University. If done in a cost-effective way, why couldn't the recovered nutrients from wastewater be valorised and turned into an additional revenue stream for wastewater operators and support local sourcing for agricultural producers?

While these ideas might be a way off yet, a new partnership spearheaded by HCL, a global technology company, and the World Economic Forum aims to identify, support and create a groundswell of water-focused entrepreneurs with demonstrated innovations. Importantly, this effort will help establish the connections and create the conditions under which "Aquapreneurs" can thrive and inspire even more ideas. While there will not be a "silver bullet" for water, the impact innovators can have has been demonstrated across other topics. If this same energy can be harnessed, guided and properly supported, it can be turned into a powerful, positive force for the water innovation agenda.

The ideas illustrated above are intended to paint the picture of possibility for the water sector and stimulate conversation as we set our sights toward the 2023 UN Water Conference. This milestone event has the promise and potential to be a pivotal moment for water. It could provide a real opportunity to spark the creativity, energy and momentum for a successful final sprint to 2030 and achieving SDG6. While the fundamentals

**A partnership spearheaded
by HCL and the World Economic
Forum aims to support and
create a groundswell of water-
focused entrepreneurs**

of water stewardship must be continued and mainstreamed at the local watershed level, and themes like addressing the water-energy-food nexus, financing, and innovation should absolutely be pillars of any water action agenda – there should be nothing stopping us all from imagining incredible, bold, transformational ideas. In fact, the imagination is where many of our greatest moments in history started. Success, however, will require a concerted effort to mobilize the commitment, expertise, networks, and collaboration of leaders from across government, industry, and civil society starting now, and arriving at the UN Water Conference. I am convinced this can be done, and through public-private cooperation, we can raise ambition, accelerate action and re-imagine our freshwater future.



SCIENTISTS ADDRESS THE IMBALANCE OF THE 'ASIAN WATER TOWER'

The imbalance is likely to be felt in downstream communities: the north having greater supply and the south greater demand



The Third Pole, which is centred on the Tibetan Plateau, stores most of the frozen water in the world after the Antarctic and Arctic. As a reliable water supply for almost 2 billion people, it has become known as the “Asian Water Tower.” However, according to a new study published in *Nature Reviews Earth & Environment*, the situation is changing.

Even as demand for its water continues to grow, the Asian Water Tower's frozen assets are melting away, with more liquid water in the northern endorheic basins and less in the southern exorheic basins. “Such imbalance is expected to pose a great challenge to the supply-demand balancing of water resources in downstream regions,” said Prof. Yao Tandong, lead author of the study and co-chair of Third Pole Environment.

The study, entitled “The imbalance of the Asian Water Tower,” describes how it has gotten out of balance. Rapid warming has changed the “stock mix” balance of the Asian Water Tower between solid water in glaciers and liquid water in lakes and river runoff. Changes in atmospheric circulations that shape the region's climate have also altered the way in which its “inventory” is distributed.

According to Dr Tobias Bolch, one of the study's co-authors and a researcher at the University of St. Andrews, the northern Asian Water Tower loses less solid water but gains more liquid water. “We believe changing multitude westerlies and Indian monsoons have contributed to more precipitation in the north and less in the south,” said Prof. Gao Jing from the Institute of Tibetan

Plateau Research (ITP), Chinese Academy of Sciences (CAS).

The imbalance of the Asian Water Tower is likely to be manifested as an imbalance in water supply and demand in downstream communities, with the north having greater supply and the south greater demand.

According to Prof. Yoshihide Wada, one of the study's co-authors and a researcher at International Institute for Applied Systems Analysis, Austria, the total water supply for the Asian Water Tower is projected to increase, but “a particularly strong increase” is expected for the northern part.

In contrast, the highest demand for water is projected to be in the southern Indus basin. Prof. Walter Immerzeel, study co-author and a researcher at Utrecht University, linked this demand to irrigation, which accounts for more than 90% of water use across the region. He noted that the densely populated Indus and Ganges Brahmaputra River basins “boast the world's largest irrigated agricultural area.”

As a result of these trends, seasonal water availability will shift in the Indus and Amu Darya River basins and increase in the Yellow and Yangtze River basins. This north (endorheic)-south (exorheic) disparity is also expected to be amplified by climate warming in the future. “Actionable policies for sustainable water resource management are greatly needed in this region,” said Prof. Piao Shilong, co-author of the study and a researcher at Peking University and CAS.

WHITE HOUSE PLAN TO TACKLE WATER SCARCITY AS NATIONAL SECURITY PRIORITY IS UNVEILED

The plan will be operationalized through Federal departments' and agencies' contributions to the U.S. Global Water Strategy

Vice President Kamala Harris has announced the launch of the first-of-its-kind White House Action Plan on Global Water Security, an innovative approach to advancing water security at home and abroad. According to a White House statement, the plan identifies the direct links between water and U.S. national security, harnessing the resources of the U.S. Government.

"It will harness the resources of the U.S. Government — from leveraging science and technology to informing our diplomacy, defense, and development efforts

— to advance global water security and foreign policy goals."

Climate change is leading to extreme weather events, including prolonged droughts and flooding, exacerbating water scarcity and contaminating water supplies. According to the United Nations, more than two billion people today lack access to safely managed drinking water.

Harris highlighted that "water insecurity makes our world less stable," and noted that water scarcity makes it harder for communities to produce food, protect public

health and drive economic growth. "Many of our most fundamental national security interests depend on water security."

The plan will elevate water security as an essential element of the U.S. international efforts to achieve national security objectives that include increasing equity and economic growth; decreasing the risk of vulnerability to shocks, conflict and instability; building inclusive and resilient societies; bolstering health and food security; advancing gender equity and equality; and tackling climate change.



NEW COLLABORATION SEALS \$15 MILLION FUNDING FOR ENTREPRENEURS TO TACKLE FRESHWATER CRISIS

HCL has partnered with UpLink, the platform of the World Economic Forum that connects start-ups with the partners and funding they need

Water security has never been more urgent. With the global population set to hit 8.5 billion by 2030, pressure is increasing on the world's limited supply of freshwater. By 2030, the global demand for water will have exceeded the sustainable supply by 40%. Government and businesses must bring freshwater to the forefront of their strategies and innovation will play a key role in their success.

To drive the freshwater conservation and management agenda, leading global conglomerate HCL has partnered with

UpLink, the open innovation platform of the World Economic Forum that connects highly promising start-ups with the partners and funding they need to scale. Through a \$15 million investment over five years, HCL will accelerate the innovation agenda for water and create a first-of-its-kind innovation ecosystem for the global freshwater sector on UpLink.

The initiative draws on HCL's regional experience of driving innovative projects in water conservation and brings global



leaders and champions together to foster multistakeholder collaboration.

"Today, freshwater resources globally are extremely burdened and every fifth child on this planet faces water scarcity," said Roshni Nadar Malhotra, CEO of HCL Group and Chairperson of HCL Technologies. "At HCL we want to make every effort to help resolve this global crisis. Our partnership with the World Economic Forum's UpLink platform is a step in this direction and our ecosystem approach can be truly transformative."



FOOD INSECURITY AND WATER INSECURITY GO HAND IN HAND, STUDY FINDS

A new study suggests improving access to water may be key to sustainably address hunger in low and middle-income countries



About one-tenth of the world's population suffers from hunger and nearly one in three people face food insecurity, according to recent estimates. Yet behind those stark figures lurks another, closely related threat: water insecurity.

In a new 25-country study, researchers report a strong link between water insecurity — a lack of reliable access to sufficient water — and food insecurity. The findings, based on data collected for the first time in 2020 by Northwestern University and the Food and Agriculture Organization of the United Nations (FAO) via the Gallup World Poll, suggest that improving access to water could be key to sustainably and effectively addressing food insecurity in many places.

The study found that people who frequently had trouble with water access

and use were nearly three times as likely to face food insecurity compared with those who did not. Further, more than two-thirds of people who were water insecure in 2020 were concurrently experiencing food insecurity. Reliable access to water is important not only to maintain proper hydration but also to support cooking, hygiene and farming.

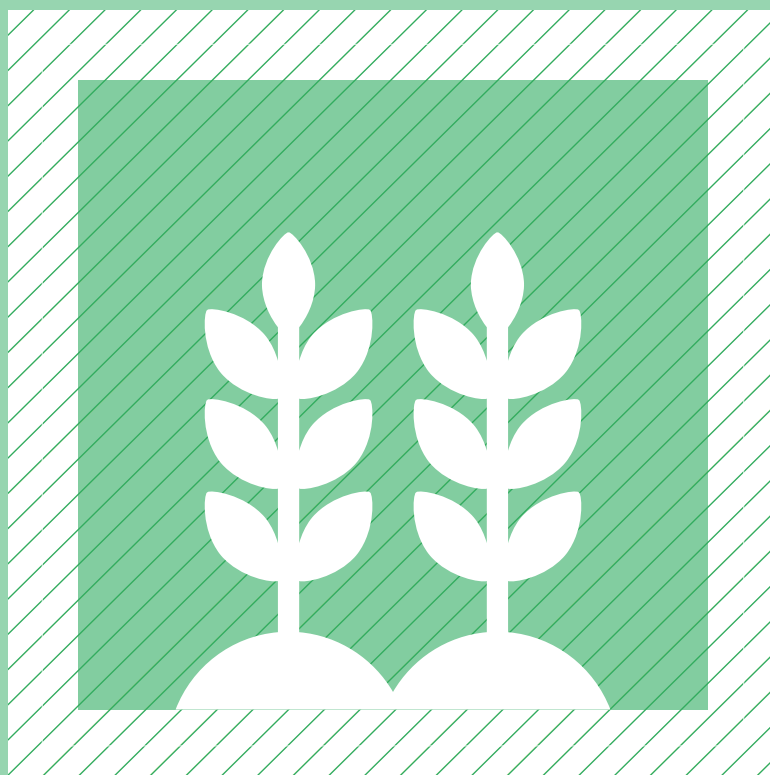
"Water insecurity is a major global health issue and its impact on biological and social well-being is only likely to grow with climate change," said Hilary Bethancourt, PhD, MPH, research associate at Northwestern University, a member of the research team.

The researchers analysed data from a nationally representative sample of over 31,000 people ages 15 and older in 25 low and middle-income countries across Africa, Latin America and Asia.

Overall, about 18% of participants were classified as water insecure; this ranged from about 15% in Asia to over 34% in sub-Saharan Africa. Water insecurity was strongly linked with food insecurity overall, though researchers said the relationship varied across regions, likely due to differences in climate, water infrastructure, social services and other factors.

While the study did not assess the causes of food or water insecurity, researchers said several factors could explain the linkage. For those living in poverty, spending money on water can mean less money available for food. For farmers, water insecurity can mean less water available for growing crops and raising livestock. Time is also an issue: traveling far from home to collect water detracts from the time available to generate income or prepare food. Water insecurity could also affect nutritional quality — a subcategory of food insecurity — since lacking the water to cook healthier foods like grains and beans may lead to a greater reliance on ready-to-eat processed foods.

Based on these findings, researchers suggested food insecurity and water insecurity should be measured and addressed in tandem. This would ensure that insufficient water does not pose an additional barrier to food security and in particular to food utilization, for example, by preventing people from using food provided by food assistance programs because there is no water to prepare it.





EVE LABALME

SENIOR ANALYST, POLICY AND INSIGHTS AT ECONOMIST IMPACT

“Our research shows that water-related challenges can be surmounted; the crises can be averted”

The first edition of the City Water Optimisation Index, launched in November 2021, assesses to what extent 51 urban areas across the globe have policies and infrastructure to optimise their water supply, distribution and treatment networks.



CRISTINA NOVO PÉREZ

Cities around the world are increasingly facing challenges related to water scarcity and the risks derived from climate change driven phenomena. Through thorough planning, sound governance, and the integration of technology, decision-makers can ensure urban water systems are optimised. Developed by Economist Impact and sponsored by Dupont Water Solutions, the City Water Optimisation Index focuses on indicators of reliability, accessibility and sustainability, and can be used to develop and refine water strategies, and prioritise projects and policies. In this interview, Eve Labalme, Senior Analyst and programme manager for the City Water Optimisation Index at Economist Impact, explains the rationale behind this project, its objectives and major findings.

Can you tell us briefly about yourself and your organisation, Economist Impact?

My name is Eve Labalme, and I'm a Senior Analyst with the Policy and Insights practice at Economist Impact, and programme manager for the City Water Optimisation Index. Economist Impact is the division of The Economist Group, publisher of the Economist newspaper,

dedicated to using original, independent research and analysis to raise awareness and enable action on the biggest issues facing our global community. At Economist Impact, I work to design and execute evidence-based economic and public policy-oriented research programmes ranging from benchmarking indexes and economic impact analysis to historical research and trend forecasting. At present, my research focuses on sustainable and inclusive economic development and innovative management techniques for natural resources in a changing climate.

How did the idea for the City Water Optimisation Index come about?

The idea for the Index came from a desire to use data-driven, actionable research to

shift the global discourse on water scarcity from one of “doom and gloom” toward practical solutions, actionable investments, and creative, sustainable paths forward.

At the risk of stating the obvious, it is difficult to overestimate the magnitude of water-related challenges cities face today and will continue to face in the future. Continued urbanisation and population growth in cities, climate change and economic development are placing pressure on water systems across the globe. A quarter of the world's population faces extremely high levels of water stress, with the prospect of taps running out — which has been dubbed “day zero” — has loomed dangerously close in cities from Cape Town to São Paulo. At the same time, rising sea levels place a growing number of geographies, particularly in East and Southeast Asia, at a higher risk of flooding, which can overwhelm sanitation systems and increase pollution of drinkable water sources.

Our research shows, however, that these challenges can be surmounted; the crises can be averted. We knew from experience that providing decision-makers with data-driven research, in the form of

“The idea for the Index came from a desire to use data-driven, actionable research to shift the global discourse on water scarcity”





There was no existing index that focused on the actions, investments, policies, and solutions available to cities right now



a benchmarking index tool, can help us identify gaps and best practices, which informs investment, collaboration, and action. However, while several existing water-related indices contributed great information to these conversations with metrics such as supply and demand, water risk and stress, and scarcity of resources, there was no existing index that focused on the actions, investments, policies, and solutions available to cities *right now* to improve their water systems.

That is the crux of why we built the City Water Optimisation Index, with the support of DuPont Water Solutions: to foment dialogue on how technological advancements and best practices can be leveraged to not only ensure access to clean, safe water for all who need it today, but also to safeguard the sustainability and resilience of that access in light of future challenges and shocks. Ultimately, we hope that the City Water Optimisation Index will play a

part in paving the way for a future where water is abundant, accessible and affordable for all, both now and in the future.

The 2021 City Water Optimisation Index was launched in November 2021. Who are the potential users, and are you aware of any cities contemplating its use already?

The index was designed to be useful to a wide range of stakeholders and users in cities across the globe -- to raise awareness, build a body of evidence, and share data on how cities are optimising their water systems and ensuring access to water for all, both now and in the future.

For example, governments can use the index as a policy check and a diagnostic tool for targeting investment. NGOs can use the index dataset, which is fully available to the public, as an ongoing research tool to highlight cities for their water optimisation efforts, test academic hypotheses, and foment discussion. The private sector can use the index as a launch pad to explore strategic decision-making, and as a tool to inform planning and investment.

All in all, a broad range of stakeholders across the water sector can leverage the index research and data to develop and refine their water strategies, learn from other cities' successes and setbacks, and prioritise projects and policies that



will have the biggest impact on water optimization, and thus water security, in the long-term. We intend to update the index regularly going forward so that cities can highlight key investments and policy changes made toward water optimisation and track their progress toward international benchmarks such as UN Sustainable Development Goal 6, availability and sustainable management of water and sanitation for all.

Would the index be a tool intended mainly for high-income urban areas, or can all cities benefit from using it?

"A broad range of stakeholders across the water sector can leverage the index research and data to develop and refine water strategies"



The index is very much intended to apply to any city, regardless of income. We selected the 51 cities for the first iteration of the Index with the express goal of including a distribution across income levels, geographies, and environmental contexts. Cities in developing or lower-income contexts are an integral part of the conversation around water access and the future sustainability of water systems, as these contexts can afford unique opportunities to implement innovative, sustainable systems and technologies. Out of the 51 index cities, 16 are low- and middle-income cities — this spread

enables the Index to provide a broad range of actionable solutions to cities independent of their income or wealth.

Though we knew it was conceptually important to expand the scope of the index beyond high-income cities, the index data itself proved the importance of including these cities: the research suggests that national income is not as important in the pursuit of water systems optimisation as one might assume, and that the levers of change towards successful water policies are available at the city level in all socioeconomic contexts. Low- and middle-income cities frequently found

themselves among the top performers in at least one of the main categories. City-dwellers in developing contexts also showed a greater eagerness to adopt future-facing water management practices than their high-income counterparts: two-thirds (67%) of respondents to our opinion survey from low-to-middle income cities reported being highly favourable to using reclaimed water, compared with 55% in high-income cities.

This strong public support for innovative water management and future-facing technologies is reflected in action on the ground in many of these cities: for example, Dakar is working on several new projects including the Janicki Omni Processor (JOP) to treat wastewater into drinkable distilled water (current in its pilot stage) and the Mamelles seawater desalination plant. Similarly, São Paulo's efforts to diversify its natural water portfolio and treat wastewater for direct industrial use as a first step toward more widespread use of treated water has boosted the city's score in the index rankings and serves as an example of a high-impact solution available to many cities.

Overall, it's clear that many practices are being implemented today in low- and middle-income cities that all other cities, regardless of income or geographic context, can look to and learn from as examples of paths forward that are well within reach.

What aspects of water management need the most improvement in cities? Is this a global trend, or does it depend on the region, or other factors such as the level of water stress?

One of the main areas for improvement we see reflected in the index data, independent of location or environmental factors, is the need to ensure the long-term sustainability of urban water systems alongside present-day water access and quality. Across the globe, city water systems face heightening temperatures, rising sea levels, population growth, and increasing urbanisation. The precise



combination of threats to future water security naturally varies from city to city, but the magnitude of future challenges and the urgency with which we must address them applies everywhere.

These concerns are of utmost importance to city-dwellers: three-quarters of survey respondents in the index cities have growing concerns about the safety and security of their drinking water. This is particularly acute in developing regions, where 82% of people surveyed shared such concerns.

What the index shows us, however, is that there is a clear path forward: survey data also revealed significant public support for investments to ensure urban water supplies both today and tomorrow. One of the most important components of a circular approach to urban water management is the treatment and reuse of water, which is already being implemented to great effect in several index cities. Reclaimed water is often considered a hard sell due to the so-called “yuck factor,” but survey data shows that the opposite is the case, and the public is ready to take the leap toward reuse.

There’s no doubt that these large-scale, systems-level changes will ultimately be necessary in all contexts, but the index also identifies numerous low-cost, high-impact policies to improve the sustainability of urban water systems. These include modifying building codes to encourage and enforce water conservation, providing public education around conservation and waste reduction, and facilitating co-operation between the public and private sectors on water use and reuse.

Could you highlight some concrete opportunities to optimise water systems in cities?

The index highlights a number of concrete opportunities, ranging from easy fixes to longer-term, larger-scale changes. One example of a low-cost, high-impact opportunity is addressing overconsumption: 20 index cities do not have

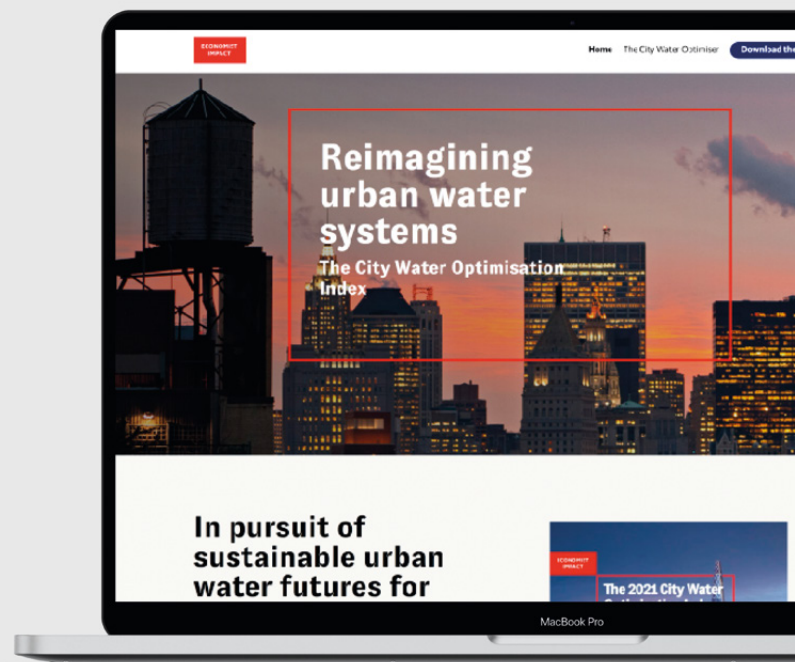
any provisions for water conservation in their building codes, while an additional 18 cities merely encourage water conservation rather than mandate it. Enacting water-oriented building codes is an example of a regulatory change that cements water’s seat at the table in conversations around the sustainability of the built environment—essential as cities grow, and as they revise existing infrastructure.

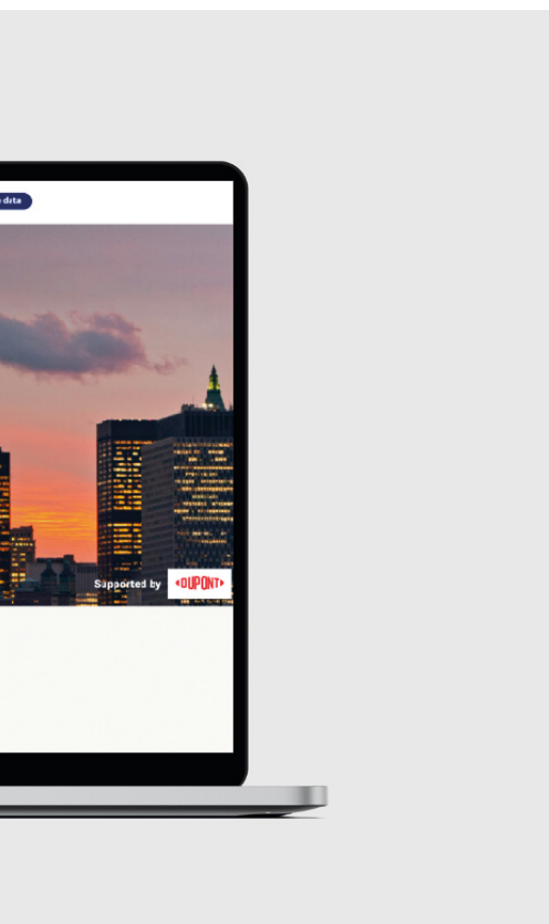
Another area that offers an important return on investment is reducing non-revenue water (NRW) — the percentage of water lost in the distribution system. Around half of the index cities had water losses equal to or greater than 25% (and in a dozen, it was 40% or more). The majority of these were lower- to medium-income cities and, worryingly, many were among the most water-stressed cities. However,

several high-income cities were also among these, notably Miami, Florida, Naples, Italy, and Philadelphia, Pennsylvania. Despite the initial costs of reducing NRW, the efficiency gains can soon outweigh the up-front costs, making it one of the most impactful ways that cities can improve the sustainability of their water systems.

You conducted a public perception survey exploring how well cities are managing their water systems. What are some of the findings?

We did: in addition to a robust desk research programme, we surveyed 5,119 city-dwellers across all index cities on the state of water and sewerage services. The survey explored perceptions on urban water and wastewater systems management, including the cleanliness, qual-





ity and adequacy of service provision, awareness of risks, and other indicators of optimised water systems.

One key finding from the survey is that ready access to water and sanitation services lies at the heart of what makes cities liveable. The public opinion survey conducted as part of the index research programme revealed that up to two-thirds (67%) of city-dwellers would consider leaving their cities if they did not have access to reliable, safe water. These types of findings may not come as a surprise, but the hard data demonstrating this reality can be a useful tool in advocating for stronger policy, more investment, and other concrete action toward protecting and ensuring water access in cities.

The survey also found that across the globe — in vastly differing geographic



We intend to update the index regularly so that cities can highlight key investments and policy changes and track their progress



and economic contexts — city dwellers are worried about their future access to water and are ready to make the necessary behavioural changes and large-scale investments necessary to ensure their supply of clean, safe water in the face of climate change and other water challenges: 61% of survey respondents reported that they would be happy to drink treated reclaimed water. Overall, it is clear that the majority of the public understands the challenges and is supportive of large-scale, long-term collaborative projects and investments toward achieving urban water optimisation.

What does the City Water Optimiser Tool involve, and how can it enable action to improve water sustainability?

At the core of what we do here at Economist Impact is ensuring that our research reaches as wide an audience as possible. For this programme, we've developed an online index hub that houses everything related to the project — all data, analysis, presentations, events, and reports. Perhaps most importantly, however, the site directs visitors to the online City Water Optimiser tool, which takes the full repository of index data and puts it in a format that is easily accessible by a variety of users, visually engaging, and intuitive to use and explore.

The tool enables action in several ways: decision-makers can explore the index

rankings to see how their city compares to other cities in the region, or cities across the globe with similar income levels or population sizes and identify opportunities for peer-to-peer learning. Users can also click on individual cities to explore their results in depth. We've also built in the ability to create an “optimised” version of a city in any given domain, enabling users to explore how their city's score and ranking might change if they made a certain investment, or enacted a particular policy.

We've also built the optimiser tool so that each configuration creates a unique web link — you can copy the web address directly from your browser bar and send it to anyone you think might be interested in seeing the progress your city could make with a few targeted investments or policy changes. And this, ultimately, is what the Index is designed to do: to start conversations, highlight key action areas, and identify solutions to enabling water access for all — today and tomorrow.

"The research suggests that national income is not as important in the pursuit of water systems optimisation as one might assume"



CLIMATE CHANGE THREATENS ACCESS TO WATER AND SANITATION, WARN UNECE & WHO/EUROPE

Changes in climate bring severe consequences for water, sanitation and hygiene in countries right across the pan-European region



From insufficient drinking water supply to contamination by sewage overflow and disease outbreaks from improper wastewater treatment, existing risks from climate change to water, sanitation and hygiene in the pan-European region are set to increase significantly, UNECE and the WHO Regional Office for Europe (WHO/Europe) have warned in intergovernmental discussions held in Geneva this week.

This comes at a crucial time as governments prepare for COP 27 (Nov 2022) and the UN 2023 Water Conference. Despite adaptation initiatives related to water management being included as a priority in many Nationally Determined Contributions (NDCs) and National Action Programmes (NAPs) under the Paris Agreement, governance mechanisms and methods for integrat-

ing water and climate are absent, and the interface of drinking water, sanitation and health is worryingly not being addressed in most cases.

In the face of rising threats, the 13th meeting of the Working Group on Water and Health under the Protocol on Water and Health – guided by a background paper –, discussed in particular how further strengthening countries' concrete measures under the Protocol's legal framework can increase resilience.

Changes in climate bring severe consequences for countries, ranging from damage to water supply and sewerage infrastructure, degradation of catchments and source water quality, spillage of human waste to the environment, reduction of water availability and contamination of water supplies to change of consumption requirements to main-

tain hydration. Some 35% of the area of the European Union is estimated to be under high water stress by the 2070s, by which time the number of additional people affected (compared to 2007) is expected to be 16–44 million. Globally, each 1 °C of temperature increase caused by global warming is projected to result in a 20% reduction in renewable water resources and to affect an additional 7% of the population.

Loss of services will result in people using unsafe water sources or being unable to maintain good hygiene practices. Changes in source water quality and quantity will increase exposure to pathogens and harmful chemicals, and lead to less reliable water supplies. Damage to sanitation systems will lead to increased exposure to pathogens.

Such impacts are already being felt in the region. Hungary, for instance, has warned of significant additional operational costs for wastewater treatment due to increased pumping energy demand and disruption to treatment plants. The Netherlands has raised challenges in ensuring water supply, as has Spain for maintaining minimum drinking water supply in drought periods.

Climate impacts on water and sanitation services further exacerbate the challenges of upholding the human rights to safe drinking water and sanitation to all, which is far from a reality today in the pan-European region: over 16 million people still lack access to basic drinking water and more than 31 million people are in need of basic sanitation.

THE NETHERLANDS IS NOT ON COURSE TO ACHIEVE THE SDGs

The major global challenges of the Sustainable Development Goals are receiving increased attention in research and policy instruments

The Netherlands is not on course to achieve the Sustainable Development Goals (SDGs) in 2030. That is one of the conclusions from the sixth national SDG report and the CBS Monitor.

The SDG Barometer from Universities of the Netherlands reveals that the total number of scientific publications linked to the SDGs rose considerably between 2015 and 2020, from more than 3,000 to well over 5,000 publications. In short, there is growing attention for the major global societal challenges in research.

The major global challenges of the SDGs are also increasingly mentioned by instruments such as the Dutch Research Agenda and the Knowledge and Innovation Covenant.

For NWO-WOTRO, the SDGs form a golden thread for the programs it plans. Via research, WOTRO aims to contribute to solutions for the SDGs, with its main focus being on the local realization of the SDGs in low and middle-income countries.

The sixth National SDG Report was compiled by the Dutch government, the



Association of Netherlands Municipalities, partly on behalf of the Interprovinciaal Overleg (IPO) and the Union of Water Boards for the decentral governments, the Confederation of Netherlands Industry and Employers, Global Compact Netwerk Nederland and MVO Nederland for industry and the financial institutions, Partos for civil society, NWO-WOTRO for the knowledge institutions, the National Youth Council and the Netherlands Institute for Human Rights.

AQUA FOR ALL AND OIKOCREDIT PARTNER TO INVEST IN COMMUNITY WATER AND SANITATION

Collaboration will develop innovative and affordable financing solutions for water, sanitation and hygiene in Africa and Asia

Not-for-profit organisation Aqua for All, specialised in innovative finance for water and sanitation, and social impact investor and worldwide cooperative Oikocredit, are launching a partnership to support water and sanitation financing and provision by partner organisations in Africa and Asia.

Under their new agreement, Aqua for All and Oikocredit will combine market expertise, knowledge and network support to develop the water, sanitation and hygiene ("WASH") portfolios of financial

inclusion partners in east and west African countries and in Cambodia. Aqua for All will provide up to €1,500,000 in technical assistance, de-risking and/or performance-based incentives. Oikocredit will invest up to €15,000,000 in portfolio financing with current and new partner organisations.

Josien Sluijs, Managing Director, Aqua for All, said: "Accelerating sustainable access to safe water and proper sanitation requires close collaboration between the WASH sector and the impact investing

sector. In Oikocredit, we have found a committed partner to boost sector transformation and improve the lives of people in low-income communities."

Mirjam 't Lam, Managing Director, Oikocredit, said: "Oikocredit is delighted to launch a new partnership with Aqua for All. Our two organisations' approaches are truly complementary. We look forward to working together and with local partners in developing initiatives that improve access to safe water and sanitation for low-income people and their communities."







"IT IS CRUCIAL TO COMMUNICATE THE SCALE OF WATER-RELATED RISKS AND HOW THEY ARE CHANGING"

Simon Williams, Media Relations Officer, UK Centre for Ecology & Hydrology

The UK Centre for Ecology & Hydrology (UKCEH) carries out environmental research across water, land and air, generating solutions and services to tackle complex environmental challenges. The communications team at UKCEH helps ensure their science informs policy, commercial innovation and conservation action. Part of that team is Simon Williams, who answered our questions on their communications role in relation to water.

CRISTINA NOVO PÉREZ

Why do you think it is important to communicate about water?

Water is essential for life but its availability and quality across the world are under severe pressure and becoming increasingly unpredictable due to climate change, land management, pollution and rapidly growing populations. This poses increased risks to us all as well as wildlife. Frequent and severe droughts and floods potentially affect crop yield, water and energy supply, homes, critical infrastructure and industrial production.

It is crucial to communicate the scale of these risks and how they are changing, as well as the ongoing research, innovations and solutions to predicting, mitigating and managing the impacts of floods and droughts.

At UKCEH we develop methods for hydrological measurement and forecasting. Our data, tools and insight are widely used by government agencies, water companies and other sectors for drought and

flood risk management, and water resources planning.

What are the most challenging aspects of communicating water-related research?

Studies of historical data show a UK and global trend towards more extreme weather conditions, and a common question from journalists and the public is whether significant flooding events are down to human-induced global warming.

However, it is very difficult to give a definitive yes or no answer because disentangling the causes of extreme weather events, in order to determine the role played by climate change and natural patterns of hydrometeorological variability, is complex. However, thanks to advanced research by UKCEH and others, there is growing scientific evidence of the connection with global warming, which, in general terms, is due to a warmer atmosphere storing more water.

Furthermore, it is difficult to convey to mainstream audi-

ences the levels of uncertainty when predicting future water availability, river flows, rainfall, as well as the timing, location and severity of drought and flooding events years, months or even hours ahead.

Could you highlight one of your organisation's communication success stories?

Last year UKCEH developed a communications strategy to promote our newly updated Bloomin' Algae app to key audiences: the public, water companies and environment officers in local and central government. The app enables people to report suspected sightings of cyanobacteria, also known as blue-green algae, which can affect aquatic biodiversity and be potentially harmful for pets and watersports enthusiasts who ingest infected water.

UKCEH adopted a targeted approach to the communications campaign, which involved providing a tailored press release to different regional media where there were outbreaks and

promotion on social media. We also linked up with a range of partners to support their own separate releases last year.

Our campaign led to widespread media coverage, contributing to a record number of reports via the app in 2021 – 76 per cent up on the previous year. It also generated interest from several water companies and local authorities whose staff received training on use of the app.

Who or what organisation inspires you when it comes to ways of communicating?

I am inspired by people rather than organisations, and at UKCEH I am very fortunate to work with hundreds of talented and dedicated scientists who are addressing the major complex environmental challenges of our time, including climate change, biodiversity loss and providing growing populations with enough water to drink and food to eat without unacceptable damage to the environment.

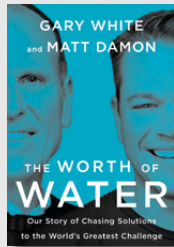


SOMETHING TO READ...

THE WORTH OF WATER

Our story of chasing solutions to the world's greatest challenge

Gary White and Matt Damon, founders of Water.org, write about their work to end the global water crisis. The book tells us about their journey, from the conviction that the water crisis can be solved, to finding an approach that works through the empowerment of families and communities.

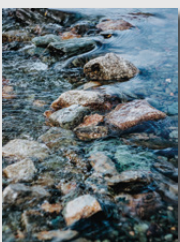


SOMETHING TO WATCH...

WATER AND POWER: A California heist

A 2017 documentary directed by American filmmaker Marina Zenovich that dives into the complexity of water rights in California.

An eye-opening look at the state's water system, it explores the historical development and appropriation of water, as well as more recent water grabbing efforts. Food for thought as California is once again in the grip of severe drought.

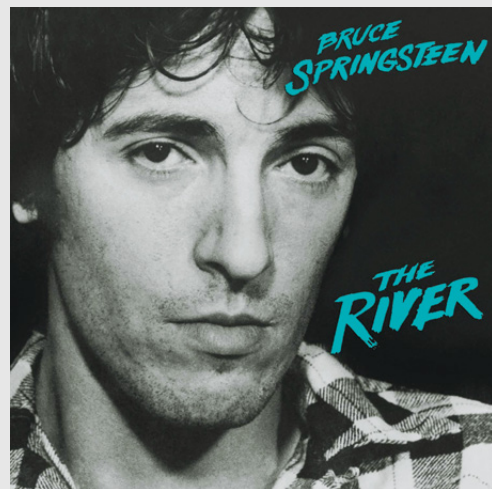


SOMETHING TO ENJOY...

THE RIVER:

Water as a metaphor for hope

In this 1979 song, The Boss tells a sad story of love and loss of youth against the backdrop of a river, which is viewed as a symbol of the dreams of the future and a reminder of better times, even when it dries up. The River is the title track of Springsteen's fifth album. It became one of Springsteen's best-known songs in the U.S.



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