GWI

WATER IS OUR CONCERN

GLOBAL WATER INTELLIGENCE MAGAZINE

2

FEBRUARY 2020

PERMIAN FRAC'ING TURNS THE TAP ON FOR MIDSTREAM WATER

AS THE UNCONVENTIONAL PERMIAN BASIN BECOMES THE WORLD'S MOST PRODUCTIVE OILFIELD, IT IS DRIVING A SURGE IN WATER SERVICES SPENDING

DESAL PRICE SPIRALS EVEN FURTHER DOWN

THE RECORD LOW PRICE FOR DESALINATED WATER HAS BEEN BROKEN TWICE THIS MONTH ALONE. WHERE CAN IT END?

WHERE IN THE WORLD ARE THE MOST ADVANCED WWTPS?

GWI'S PROJECT TRACKER IDENTIFIES THE HOT MARKETS AND THE KEY PLANTS FOR THE SHARP END OF THE WASTEWATER TREATMENT MARKET

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T. +43 7258 7900
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Volume 21, Number 2

Published by:
Media Analytics Ltd.
Suite C, Kingsmead House
Oxpens Road
Oxford OX1 1XX
United Kingdom
T: + 44 (0)1865 204 208
F: + 44 (0)1865 204 209

E-mail domain name:
globalwaterintel.com

Publisher:
Christopher Gasson
cg@globalwaterintel.com

Editor-in-Chief:
Ian Elkins (E-mail: ie@)

Editor:
Tom Scotney (E-mail: ts@)

Editorial Director:
Sebastian Lennox (E-mail: sl@)

North America Editor:
Paul Hasler (E-mail: ph@)

Technology Editor:
Charlie Walker (E-mail: cw@)

Technology Consultant:
Tom Pankratz (E-mail: tp@)

Europe Editor:
Sébastien Mouret (E-mail: smouret@)

Asia Editor:
Malin Hedlund (E-mail: mhedlund@)

Marketing Director:
Chantal Marchesi (E-mail: cmarchesi@)

Sales Director:
Jack Ceadel (E-mail: jmc@)

Head of Global Sponsorship:
Abigail Edwards (E-mail: abigail.edwards@)

Advertising Executive:
Ruth Newcombe (E-mail: rn@)

Registered Company Number: 4412085

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FEB 2020

GLOBAL WATER INTELLIGENCE

COVER STORY: The explosive growth of the US unconventional energy sector has made the Permian Basin the world's most productive oilfield. This is creating a huge and fast-growing market for midstream water services (*see page 26*).

NEED TO KNOW

Another new low for desal prices; Abu Dhabi shuffles its assets; Manila Water's new owner; India's RO ban; Macquarie starts its exit from China; Funding US stormwater; Permian midstream spending takes off; Kenya's NRW reduction strategy; all the latest news from around the world this month.

BROKEN RECORDS

● After months of clarifications, the **Saudi Water Partnership Company** has finally published the bids for its 450,000m³/d Yanbu 4 desalination project. A consortium of **Engie** and local developer **Mowah** with **Doosan** as the EPC (engineering, procurement and construction) contractor ended up first-ranked, with a record low water price of $0.47/m³. There seems to have been a fair amount of movement along the way (*see story p10*).

● GWI got it wrong back in October when it mentioned the rumour that the low bid for Yanbu 4 was $0.45/m³, so we are a little hesitant in repeating the rumour we picked up relating to the pricing of the SWPC's 600,000m³/d Jubail 3a project. Nevertheless, we have it on pretty good authority that **ACWA Power** has offered $0.44/m³ (SAR1.65/m³). If true, it would be the fourth time that the record for the lowest price for seawater desalination had fallen in 18 months. Blame solar power.

● Saudi Arabia's **Saline Water Conversion Corporation** seems unconvinced by the SWPC's record-breaking auctions. After failing to secure a budget allocation for its new-build membrane desalination programme, it has turned to the local banking sector to fund the Jubail 1 Replacement and Khobar 2 Replacement projects. It is the first time the agency has had to borrow money commercially (*see story p14*).

● Kuwait's Umm al Hayman independent sewage treatment project has finally reached financial close. The process has been slow – GWI has been following the project closely ever since its launch, almost ten years ago (*see story p13*).

GULF UTILITIES

● Abu Dhabi has reshuffled its utility assets between its two holding companies **Taqa** and **ADPower** (formerly ADWEA). The result is that ADPower will own 98.6% of Taqa, which in turn will become the world's largest utility holding company, with assets of $55 billion across water, power, and upstream energy. It opens the door to a whole new world of fundraising (*see story p15*).

● Saudi Arabia's **NWC** is on the cusp of completing a massive smart metering programme after installing nearly 2 million smart meters in three years – more than one every minute. The programme has already reduced NRW by 3.4% over the last year, unified billing under a central system, and reduced meter reading costs by 75%. It will set the NWC up well for integrating a new clutch of management contracts. Bids for the first cluster were submitted at the end of January (*see story p12*).

● **Saur** has extended its **Marafiq** JV for another five years. It is good news for the French company, which recently lost its executive chairman Louis-Roch Burgard after a string of project losses in France and the Middle East. It is a nice contract: Marafiq's regulated utility business has quietly expanded its remit over the years, from Jubail and Yanbu to Ras Al Khair in 2016, and now potentially on to Jizan (*See story p13*).

ASIAN MOVES

● Port services tycoon and billionaire Enrique Razon Jr. has taken control of **Manila Water**. He only bought a 25% stake, but the Ayala family gave him proxy rights over some of their shares, giving him an effective 51% voting stake. The move comes after a sustained campaign against the Ayala family by Filipino President Duterte in relation to their management of the utility (*see story p32*). Razon is considered to be a more neutral figure.

● **India's** $50 billion drinking water programme aimed at 100% tap connectivity, the Jal Jeevan Mission, appears to have been scaled down even before it started. Only INR115 billion ($1.6 billion) was allocated for the first year of the mission plan in this month's Union Budget – rather less than the INR208 billion ($2.9 billion) mentioned in the JJM guidelines released in January 2020 (*see story p37*).

● The Indian government ▶

AFTER THE FIRE, THE FLOOD

Desalination is back on the agenda in Australia – or is it? Last year's droughts fanned fires, sapped reservoirs, and seemed to prove the case for the big 'insurance' plants build a decade ago in each of the big cities. Now the rain has started again and the whole place is flooded out as reservoirs top up again. Sydney is currently weighing up plans to add 250,000m³/d of capacity, while Hunter Water, despite being largely underwater as a result of heavy rainfall, is considering expanding the size of its proposed plant (*see story p34*).

Source: Reuters

is proposing to outlaw reverse osmosis in point-of-use domestic water treatment systems. The Ministry of Environment, Forests and Climate Change thinks that they waste too much water in the brine reject (*see story p36*).

● **Macquarie** has struck the first deal under its long-harboured plan to sell its Chinese water assets. The yard sale began this month when **Beijing Capital** agreed to buy **Dalian Hengji Xinrun Water Company** for $179 million (*see story p33*).

SURGING FORWARD

● The **US Environmental Protection Agency** has published a review of stormwater funding. At the moment there are no dedicated arrangements to help cities cover the cost of improving their stormwater management, although a new stormwater state revolving fund is one of the proposals under discussion (*see story p25*).

● A surge in produced water volumes from 21.7 million bbl/d (barrels per day) in 2020 to 30.8 million bbl/d by 2025 will drive an uptick in spending on oilfield water management in the Permian Basin, according to a new report published by GWI this month (*see story p26*).

● As **Brazil's** parliament debates legislation which would require universal sanitation coverage by 2033, three state-owned utilities have filed for IPOs (*see story p30*).

● Orange County Water District has taken 30 wells out of production as a result of trace contamination by per-and-polyfluoroalkyl substances. The wells represent 20% of the water district's supply, and the problem could cost $850 million to fix (*see story p29*).

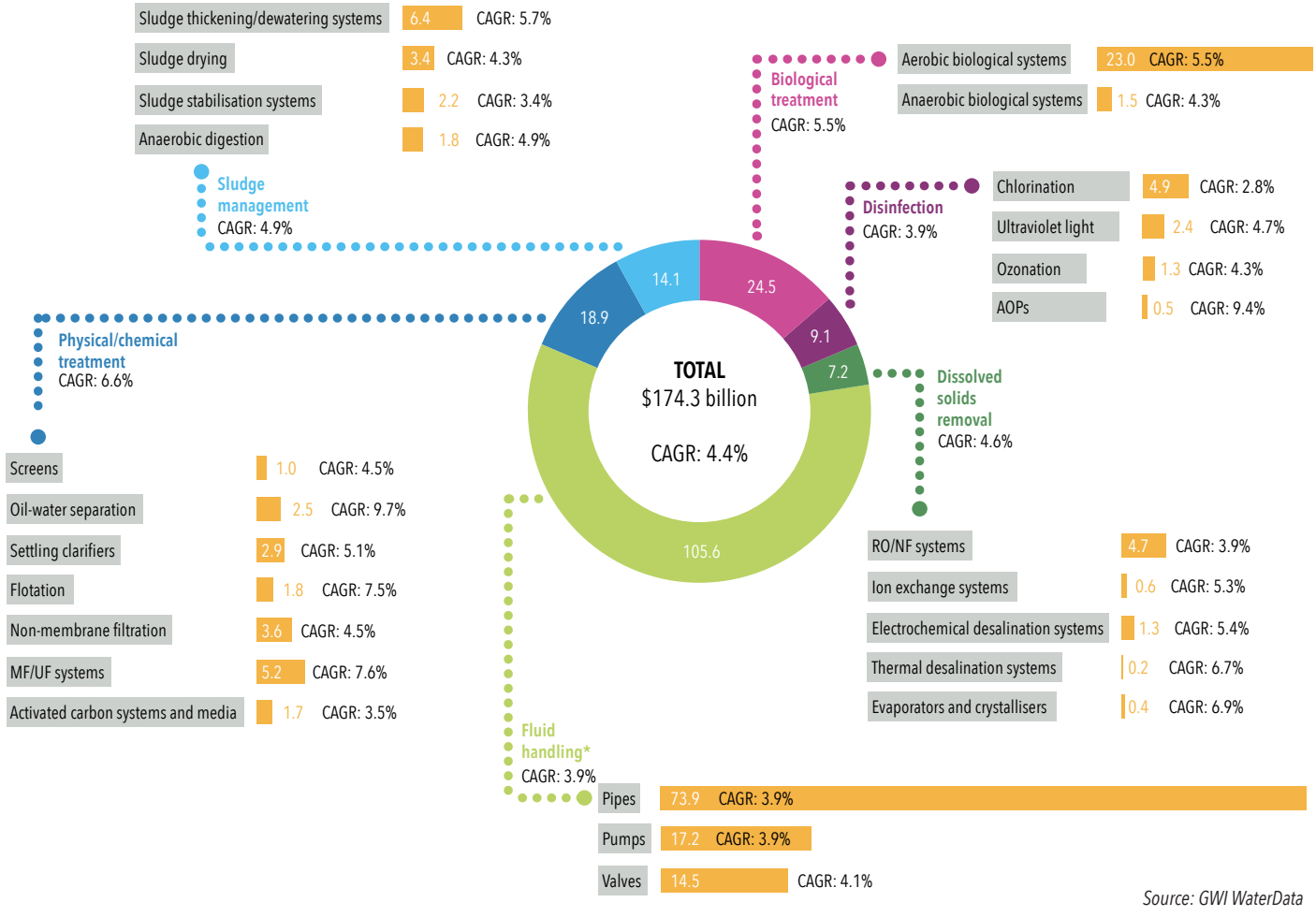
KENYATTA

● **Kenya's** water regulator is seeking consultants to help it design performance-linked non-revenue water reduction contracts. On average, 42% of the water in Kenya's utility systems is currently unaccounted for (*see story p14*). ■

CHART OF THE MONTH: THE GLOBAL WATER TECHNOLOGY MARKET

This month's chart comes from the latest research into the water technologies market undertaken by the GWI WaterData research team. It shows the $174 billion water technology market broken down into 25 technology categories, together with their 2019 revenues and their compound annual growth rates to 2024. Many of the numbers may seem counter-intuitive. For example, settling clarifiers are slated to grow at 5.1% per year and reverse osmosis systems at just 3.9%, despite the former being a deeply mature technology, and the latter enjoying a wealth of opportunities in both the municipal and industrial markets.

The reasoning is that emerging markets with the highest growth rates such as India and Vietnam will spend on basic technologies such as clarifiers, while the biggest market for reverse osmosis systems is the Gulf seawater desalination sector, which is due to peak in 2020. The new research was aimed at providing more granular data on these technology markets. Besides showing revenues and growth rates for 25 technology categories at a national level, it is also possible to drill down to see data for 88 technology niches at a global and regional level. For further details, contact Rebekah Donald at rd@globalwaterintel.com.



Source: GWI WaterData

THE LIST

The water industry's most powerful women

Who are the women with the biggest jobs in water? Five years after we first compiled our power list, only two are still in the top 20.

1

LIV GARFIELD
CEO, Severn Trent

The woman with the biggest job in water: serving 8.6 million people with water and sewerage in England

2

TERESA VERNAGLIA
CEO, BRK Ambiental

Runs Brazil's largest private wastewater concessionaire, serving 17 million people

3

ESTELLE BRACHLIANOFF
Group COO, Veolia

Veolia's number two is as sharp as a knife and not sentimental about water

4

JENNIFER SARA
Global Director (Water Practice), World Bank

The World Bank's water supremo oversees a $25 billion portfolio of water assets

5

CORA VAN NIEUWENHUIZEN
Minister of Infrastructure and Water Management, The Netherlands

The water minister in the country where water matters most at home and abroad

	Name	Organisation	Role	Observations
6	Rachel Fletcher	Ofwat	CEO	The third woman in a row to head the UK water regulator has also been the most assertive
7	Liz Barber	Kelda Group	CEO	Serves five million people with water and wastewater services in Yorkshire
8	Heidi Mottram	Northumbrian Water	CEO	Modest, intelligent, and extremely effective, she is probably the most widely respected water CEO in the UK
9	Diane Galbe	Suez	Group SVP of strategy	The woman behind Suez's 'Shaping Suez 2030' strategy and the resultant divestment programme. She is the youngest person on this list
10	Anne Désirée Ouloto	Côte d'Ivoire government	Minister of Sanitation and Hygiene	Known as "Maman Bulldozer", she is presiding over a $1.2 billion spend on sanitation and drainage in greater Abidjan over the next five years
11	Eileen Sobeck	California State Water Resources Control Board	Executive Director	Four decades of government service and a law degree mean she is hardened to the realities of protecting California's natural water resources
12	Susanne Dorasil	BMZ	Head of Water, Urban Development & Mobility	Taking responsibility for Germany's financial and technical assistance in water, she has proved to be both focused and creative
13	Cindy Wallis-Lage	Black & Veatch	President (water business)	Unstoppable engineer who is one of only two people on this list who were also on the 2015 Women in Water Power list
14	Debra Coy	XPV Capital	Partner	The most intelligent analyst in the US water sector, turned tech investor
15	Yvonne Forrest	Houston Water	Director	A chemical engineer who was appointed to run Houston Water just in time for Hurricane Harvey in 2017
16	Brenda Burman	US Bureau of Reclamation	Commissioner	Runs the bulk water supplier serving 31 million people, with responsibility for some of America's biggest water projects
17	Mirka Wilderer	De Nora Water Technologies	CEO	The disinfection specialist is the only major water technology company to have a woman at the helm
18	Lindiwe Sisulu	South African government	Minister of Human Settlements, Water & Sanitation	Appointed in May last year, Sisulu is pushing a ZAR900 billion ($59 billion) plan to end South Africa's water crisis
19	Alice Laidlaw	International Finance Corporation	Global Head of Cities and Environmental Infrastructure	The quiet but effective head of the World Bank Group's private finance operations in water
20	Sicily Kariuki	Kenyan government	Minister of Water and Sanitation	Moved from the health portfolio to water last month by Uhuru Kenyatta, she is focused on reducing the waterborne diseases which kill 19,000 Kenyans a year

Image sources (left to right): Severn Trent, LinkedIn, Veolia, The World Bank, Government of the Netherlands

EVENTS DIARY

All the key events coming up in the global water and wastewater industry.

FEBRUARY 2020

26-28	**FiltXPO.** Chicago, IL, USA

MARCH 2020

16-20	**Membrane Technology Conference 2020.** Phoenix, AZ, USA
17-19	**Saudi Water Forum.** Riyadh, KSA
24-25	**Future of Utilities 2020.** London, UK
29-31	**Global Water Summit 2020.** Madrid, Spain, ft. the **2020 Global Water Awards**
31-1 Apr	**Water Show Africa 2020.** Johannesburg, South Africa

APRIL 2020

1-2	**WaterVent 2020.** Storrs, CT, USA
7-8	**Waste Water Management 2020.** Kyiv, Ukraine
20-21	**Smart Water Systems.** London, UK
20-22	**Design-Build for Water/Wastewater.** Dallas, TX, USA
26-29	**Metering China 2020.** Beijing, China

MAY 2020

5-7	**OzWater 2020.** Adelaide, Australia
12-14	**African Utility Week.** Cape Town, South Africa
27-29	**Ultrapure Micro 2020.** Austin, TX, USA

Contact the GWI events team for more information on media partnerships:
www.globalwaterintel.com/events
PDF users can click through on the event names above

IN FUTURE EDITIONS...

MAR	● Stantec's global water strategy ● US contract ops market review
APR	● All the 2020 Global Water Awards winners

FROM THE PUBLISHER

Water's future in a borrow-and-build economy

Christopher Gasson looks at how flagging global demand has changed the rules of economics in favour of the most profligate spenders.

Where will the world find growth over the next decade? It is a big economic question, but one which will ultimately shape the future of water, and it is therefore something worth asking at the beginning of 2020.

There are two big challenges which governments around the world are having to contend with. The first is the fact that most of the productivity gains are delivered by a small number of highly profitable and globally successful companies which pay their elite staff well, while leaving the mass of unskilled and semi-skilled staff no better off than they were in the 1970s. The second is that manufacturing jobs, which have historically provided the bedrock of demand in advanced economies and the pathway to economic development in low- and middle-income countries, are increasingly being monopolised by China. This situation is likely to persist even as China moves towards becoming a high-income economy. The combination of rock-bottom capital costs and the scale of the operations that it has been able to achieve make it difficult to compete with China from any direction.

Together, these two challenges have the impact of reducing global demand. The world-beating high productivity firms and their elite staff pile up cash which they struggle to spend, while globally (outside China) the blue-collar worker who accounts for the bulk of the spending in most economies is no better off than he was in the 1970s. The result is flagging global demand, which is even weighing down China's economy.

The solution is the same the world over: low interest rates, big budget deficits, and plenty of construction spending. It makes sense in political terms. Construction spending creates the kind of blue-collar jobs which the rest of the economy no longer produces. With interest rates at an all-time low in many countries, deficits are cheaper than ever to finance.

Most economists would agree that this strategy can't work in the long term. Construction-led growth needs to be sustained by ever-increasing levels of debt. Eventually the bubble bursts. Or does it?

I was in Turkey earlier this month, and it is living proof that the old rules of economics no longer apply. For the past 18 years, Turkey has borrowed to build infrastructure in order to create jobs that win votes for President Recep Erdogan's AK Parti. The reckoning seemed to come in 2018, when investors took fright at growing inflation and slowing growth, and stopped financing the bubble. The currency was devalued by 30%, interest rates rose to 24%, and the economy slumped into recession. But so far it has avoided the Greek lesson in austerity. Erdogan appointed a new head of the central bank, who went against the received wisdom that interest rates had to be kept high to squeeze out inflation. They have been cut progressively to 10.75%, and sky has not fallen. In fact, the consensus is that the economy will grow by 3% this year and inflation will be beaten. It says to me that investors have fundamentally changed their attitude towards governmental profligacy. This unsustainable economic model could be sustained for a lot longer yet.

So what does the extension of this "borrow-and-build forever" economic model mean for water? My view is that it makes capital spending paid for by debt look cheaper than operational spending paid for by tariff income, because tariff rises are seen as an assault on blue-collar incomes. This could make procurement less progressive: the focus will be on building as many assets as possible at the lowest price, rather than delivering the best service most cost-effectively over the lifetime of those assets.

In the longer term, the emphasis on assets rather than service has another implication. It means that when the bubble finally bursts, utilities won't look like efficient public service providers. They will look like under-performing and capital-heavy asset-holders ripe for privatisation. ■

GWI WATER INDEX

Index soars on defensive rally

Fears over the economic effects of the coronavirus outbreak helped low-beta names with limited global exposure drive the GWI Global Water Index to a new high this month.

The GWI Global Water Index soared by nearly 6% to reach a new all-time high this month, as many large-cap names outperformed the wider equities market by a considerable margin.

While UK water utilities' reliance on domestic supply chains meant they were largely able to shrug off any lingering concerns over Brexit, the fact that the three remaining listed companies all accepted Ofwat's price determinations for the next five years also went a long way to removing any uncertainty over the possibility of a protracted battle with the Competition Commission (*see story p20*).

US investor-owned water utilities also had a strong month, with the top performer being Essential Utilities – which was rebranded from Aqua America on 1st February in anticipation of its acquisition of Peoples Gas.

The popularity of defensive names over the past month was to some extent driven by a growing unease over the effect that the coronavirus outbreak in China could have on the global economy. This also pushed a number of quoted Chinese water names markedly lower, as the movement of goods within the country – and beyond its borders – became increasingly challenging.

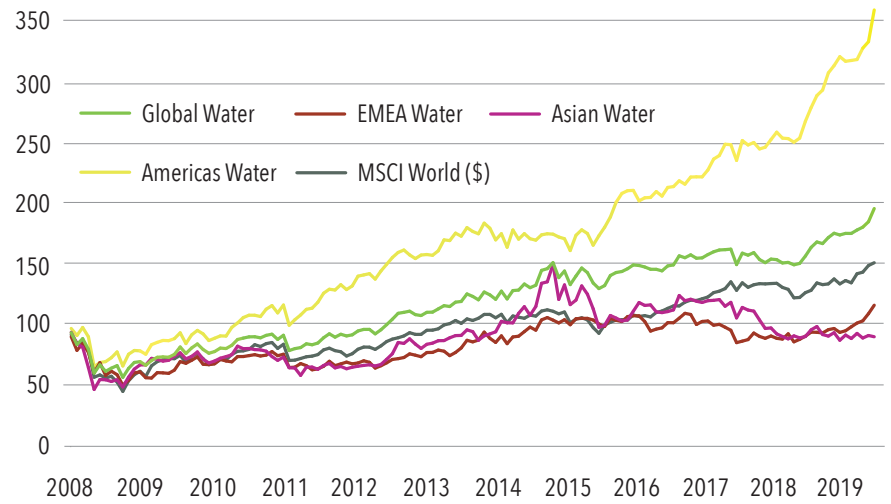
The two stocks which did outperform spectacularly this month both had something to prove: although Evoqua's star has been in the ascendant since the start of 2019, it took a robust set of first-quarter results on 4th February to catapult it out of the range-bound quagmire it has been sitting in since mid-November. Q1 revenues of $346.1 million (up 5.7% organically year-on-year), and adjusted EBITDA of $43.6 million (up 13.5% y-o-y) went a long way to reassuring investors that the company is back in solid growth mode.

Filipino concessionaire Manila Water, meanwhile, bounced back strongly after December's catastrophic decline when it emerged that the company had attracted a new anchor investor in the form of local port tycoon Enrique Razon Jr. He may have agreed to subscribe for $200 million of new shares and acquire 51% of the voting rights, but it remains to be seen whether Razon's sway with President Duterte can secure the company's long-term future as the water concessionaire in Manila's East Zone (*see story p32*).

Glancing ahead, the quarterly results season still has a long way to run, with Suez, Essential Utilities, Stantec, SJW and Forterra all due to report full-year results on 26 Feb, while Veolia is set to unveil its new strategic plan on 28 February. ■

HOW DID WATER STOCKS PERFORM THIS MONTH?

A strong showing from a number of large-cap names ensured a healthy outperformance for our index this month. The spread of coronavirus supported defensive signatures, but kept a lid on Asian water stocks.



1st January 2008=100. Calculated on 10 Feb. Index has 67 stocks, weighted by market capitalisation and water exposure.

REGIONAL TRENDS

GWI Index	Value on 10 Feb	Change
Global Water	**196.67**	5.86%
Asian Water	**90.74**	-1.15%
EMEA Water	**116.81**	6.39%
Americas Water	**360.73**	7.84%

10 BEST PERFORMERS

Company	Monthly change (10 Jan-10 Feb)
Evoqua	30.18%
Manila Water	28.24%
Advanced Drainage Systems, Inc.	15.00%
Essential Utilities	14.76%
Middlesex Water	12.03%
Veolia	11.50%
Acea SpA	11.02%
Pennon Group	10.82%
Consolidated Water	10.78%
California Water Service	10.51%

10 WORST PERFORMERS

Company	Monthly change (10 Jan-10 Feb)
Fluence Corporation	-23.08%
Moya Holdings Asia Limited	-15.29%
SIIC Environment	-14.81%
Poten Environment Group	-12.98%
Cadiz, Inc.	-12.60%
Yunnan Water	-11.05%
Qianjiang Water Resources	-10.72%
Shanghai Safbon	-8.33%
Ranhill Holdings Berhad	-7.34%
Salcon Berhad	-6.82%

BIG WATER

Company	Monthly change (10 Jan-10 Feb)
Essential Utilities	14.76%
Veolia	11.50%
American Water	10.32%
Suez	7.84%
Xylem Inc.	7.23%
Sabesp	6.83%
Kurita Water Industries	4.87%
United Utilities	4.35%
Severn Trent	4.11%
Pentair	-3.14%

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2020 SPEAKER HIGHLIGHTS

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WASH-FIN

TAQSEM KHAN
Dhaka WASA

ERIN MAHONEY
The Regional Municipality of York

ADAM LOVELL
Water Services Association of Australia

ALEJANDRO BEIVIDE
Acciona

ULRIKE FRANZKE
Berliner Wasserbetriebe

GUILHERME ALBUQUERQUE
Brazilian Development Bank (BNDES)

AUDE GIARD
Veolia Water Technologies

CARLOS CAMPOS
SUEZ

AHMED AL-MAZROUY
Majis Industrial Services

HP NANDA
DuPont Water Solutions

JEAN-BAPTISTE THUBERT
Sidem-Veolia

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COST OF DESALINATION

Saudi bidders push the price of desal twice in a month

The benchmark for desal pricing continues to tumble. After bids for the Yanbu 4 plant inSaudi Arabia set a new record for low pricing, rumours came in of an even lower bid.

This month in the Middle East and Africa:

Bids submitted for the most recent privately financed Saudi desalination plant to be put on the market have seen the price of desalination tumble to a new low – despite ongoing worries over the overall financial sustainability of the market.

On 13 February the Saudi Water Partnership (SWPC), the central water PPP body for the Kingdom, announced that a team comprising French project developer Engie and local partner Mowah had been named as preferred bidder for the 450,000m³/d Yanbu 4 independent water plant (IWP) after submitting the lowest bid for the project (*see table, below*).

At just SAR1.7446 ($0.47) per cubic metre, the tariff submitted by the Engie-led team represents the lowest ever price for water bid for a GCC desalination project. This was despite the fact that that the Yanbu project also folds in a significant water storage construction element – an unusual situation for an IWP contract, and one that the market had expected to push up the pricing beyond the benchmark set by a series of contracts awarded by Saudi Arabia and its neighbours in recent years.

In even more stunning news, shortly after the Yanbu prices were made public, rumours began to circulate that bids for the next independent water plant, the Jubail 3a facility, included a low-bidder tariff equivalent to just $0.44/m³.

BIDDERS AT YANBU 4

The new record bid for Yanbu 4 was not an outlier. The Engie-led team was followed closely by a host of other bidders.

Team	Bid (SAR/m³)	Bid ($/m³)
Engie/Mowah	1.7446	0.47
Aqualia/HAACO/Alfanar	1.7775	0.47
ACWA Power/Albabtain/GIC	1.8435	0.49
Marubeni/Marafiq	1.9168	0.51
Veolia/Alkhorayef/AlBawani	2.0242	0.54
Utico*	1.7446	0.47

** Claimed – bid not ruled compliant* *Source: SWPC*

THE SAUDI PRIVATISATION RAILROAD

The under-construction Shuqaiq 3 plant was secured with a then-world record tariff of $0.52/m³ submitted in September 2018. A year and a half on, and the benchmark has been pushed down by nearly 10% already.

Source: SWPC

The constantly falling price of privately financed desalination (*see table, opposite page*) has been a boon for countries in the Gulf looking to build out their water generation portfolio, but has created some controversy within the international water market. EPC contractors have been put under pressure to drop margins to keep overall project costs down, and there has been some doubt case over whether the ultra-low prices bid really represent a sustainable situation, or an overstuffed market where bidders are desperate to win contracts by any means necessary.

The Yanbu bid was put forward by a team comprising both developers and contractors that will have been particularly keen to secure references. Engie – under its former guide as GdF Suez, and incorporating the International Power portfolio in 2011 – built up an extensive portfolio of water desalination assets mainly won as thermal-driven hybrid independent water and power projects when that was the model of choice for the Gulf. The portfolio it built up still makes it a major player in the Gulf, but in more recent years it had to some extent been overtaken by developers with more local connections and more direct expertise in water as membrane technology took over and desalination projects were tendered in isolation rather than alongside power plants. ▶

The Yanbu 4 bid marks a major step up in the water market for Engie. It is the first time it has taken such a prominent role investing in a water-only asset, although it was part of the team that secured the Barka 4 IWP in Oman in 2015 alongside Itochu, W.J. Towell and erstwhile business partner Suez.

Meanwhile, the EPC for the leading Yanbu bid is understood to be led by Doosan. The Korean company was the contractor of choice in Saudi Arabia for many years when the country negotiated directly with contractors and paid them directly. Doosan's aggressive pricing and mastery of then-current thermal desalination secured it the lion's share of the projects procured by the Kingdom at that time. However over the last decade, the shift to privately financed projects and more efficient membrane desalination has seen Doosan struggle to keep up the level of its impact.

With a preferred bidder in place, the SWPC is expected to formally award the project imminently with the signing of a water purchase agreement. The Engie/Mowah team will then seek to reach financial close in the first half of the year. The strong level of interest from banks in the Saudi PPP market means that projects have generally managed to reach financial close very quickly (*see Global Water Awards, p58*).

One bidder that was not listed among the five 'compliant' tariffs announced by the SWPC was the UAE-based Utico. Richard Menezes, managing director of Utico, told GWI that the company had submitted a tariff that was identical to the Engie-led bid, but that despite the company being qualified to bid, its submitted offer had not been listed among those announced as compliant bids on 13 February.

"We respect SWPC's decision, but the facts must be noted that the said tariff was submitted by Utico and negotiated with SWPC alongside the other bidders of choice by the client," he said.

"For whatever reasons SWPC found our bid non-compliant and, while SWPC is of course within their rights to do the final award to any party, Utico is within its rights to let know that the announced tariff for their preferred bidder is exact to the third decimal point as Utico's submitted tariff." ■

WHERE NEXT FOR DESALINATION?

Since the revival of privately financed desalination projects in the past few years, the prices bid have continued to drop. Despite consternation from contractors worried about margins, and rival developers worried about non-competitive pricing, the drop in prices shows no sign of stopping.

Plant	Country	Capacity (m^3/d)	Bids opened	Low bid price ($/m^3)	Developer
Jubail 3a	KSA	600,000	tbc	0.44*	ACWA Power/GIC/Al Bawani
Yanbu 4	KSA	450,000	Feb 2020	0.47	Engie/Mowah
Taweelah RO	UAE	900,000	Oct 2018	0.49	ACWA Power
Shuqaiq 3	KSA	450,000	Sep 2018	0.52	Marubeni/Almar/Rawafid
Rabigh 3	KSA	600,000	Aug 2018	0.53	ACWA Power/Saudi Brothers

** Unconfirmed*

Source: GWI

SMART METERING

NWC smart metering success sets the stage for private sector collaboration

Saudi Arabia's water utility is reaping the benefits of smart water, as bids come in for its first regional private management programme.

Saudi Arabia's National Water Company (NWC) is moving into the final stages of a massive smart metering programme that has made a massive change to the company's operating abilities – and set it in place for its upcoming privatisation.

The NWC – the water and wastewater utility that has served the whole of the Kingdom's 33 million-strong population since its remit was expanded in 2018 – has installed 1,784,604 new smart meters since the start of its programme in 2017 (*see table, below*), the equivalent of more than one meter every minute.

It means that smart meter coverage across the country is above 85% and in some regions significantly higher (*see map, right*).

Before the programme began in 2017 the vast majority of meters in the country were the old mechanical type and put in the ground, making them difficult to read. The introduction of new water tariffs in 2016 made it a priority to improve the billing service for the NWC.

A spokesman for the NWC told GWI that at the start of 2020, the programme was already 96% complete, and was already paying dividends, as well as assuaging fears over the impact of water tariff changes – a sore point when they were introduced.

The spokesman said that 60% of bills issued by the organisation were now based on automatic meter readings, feeding into the company's newly launched unified billing system.

As of December 2019, nearly 90% of the population were receiving bills on a monthly basis, compared to 60% at the end of 2016.

It has also helped reduce the utility's profitability – non-revenue water was reduced by 3.4% in 2019 alone.

Meanwhile the cost of meter reading was reduced by 75% compared to the situation when the majority of metered bills were based on readings from 'dumb' machines.

The metering programme, and the additional data and control it generated, will set up the NWC well for its long-planned privatisation process, the early stages of which gathered space at the start of the year.

The first stage of the process will see six regional 'clusters' covering the whole of the country handed over to private operator-managers working on a performance-linked basis for a period of 5-7 years.

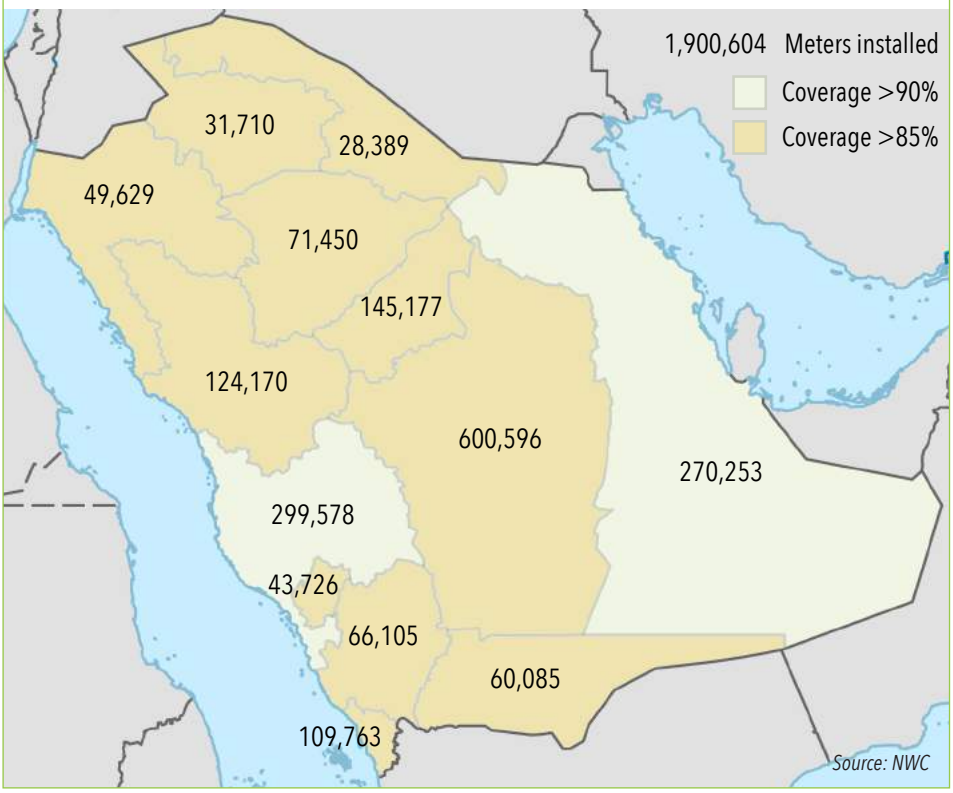
The intention is for these management and operations contracts to eventually morph into long-term concession agreements that would see far more extensive private involvement in the funding and handling of water and wastewater infrastructure.

Bids for the first of the management contracts, covering the north-west region of the country, were submitted at the end of January and are currently under consideration by the NWC and its advisors.

The amount and quality of data available was a significant issue for potential bidders on the contracts, an issue that the rollout of the metering programme will have made a big step toward addressing ■

WHERE WERE THE SMART METERS DEPLOYED?

Since the start of the Saudi smart metering programme, meter provision has risen exponentially. 85% coverage is the benchmark for the whole country, with some areas seeing even higher levels.



SAUDI METER ROLL-OUT

Since the start of the NWC's smart meter roll-out programme in 2017, nearly 1.8 million of the devices have been installed.

Year	Meter installations at year-end*
2019	1,900,604
2018	1,234,855
2017	721,455
2016	116,000

** Cumulative total* *Source: NWC*

INDUSTRIAL OPERATIONS

Marafiq renewal boosts Saur's global goals

The company has extended its unique Saudi industrial operating joint venture in a deal worth in the region of €120 million a year.

French water operator Saur told GWI it was on track to reach its ambitious international revenue growth targets after securing an extension of its groundbreaking operations partnership with Saudi Arabia's Marafiq – a partnership that could expand further in scope as the industrial city utility broadens its horizons.

At the end of January, Saur announced that it had secured a five-year extension to the MaSa joint venture, the 49:51 partnership between it and Marafiq, respectively, that is responsible for operations and maintenance of water and wastewater assets in Marafiq's remit. The contract originally signed in 2011 expired at the end of December 2019, but will now last until the end of 2025.

The performance-linked contract – one of the largest of its kind in the world – represents revenue in the region of €120 million a year to the partnership. The extension comes with a new set of targets relating cost optimisation and upgrading of facilities after the initial timeframe focused on improvements to key factors like non-revenue water.

Saur senior executive vice president for international business Emmanuel Vivant told GWI that while the process of cost optimisation meant that the margin on the contract was likely to reduce, the expansion in scope of the contract meant the income for the partnership would increase compared to the first seven years.

The MaSa contract signed in 2011 covered only the industrial city of Jubail. In 2014 this was expanded to cover Yanbu on the Kingdom's Red Sea coast, and then in 2016 this was further expanded to Marafiq's third area of operations, Ras Al-Khair, in the country's North East. It now serves dozens of utilities and around 400,000 residents with cooling water, potable water and wastewater handling services.

With rumours circulating that Marafiq's remit could be extended to yet more areas, with the Jazan region rumoured as one possible new area where the body could take on a role as regulated utility, the MaSa contract could be set for further expansion in years to come.

"This is an important piece in our strategy in the region and we are very excited to continue to work with Marafiq," Vivant said. "The extension wasn't guaranteed and we have a number of new operational targets after beating our targets since 2012 in terms of operational performance.

"One of these new targets is cost efficiencies so we are going to deliver the same service with more efficient organisation. That means on the same scope basis the financial impact for us will be going down, but that being said, the scope itself is going to increase because of the expanded area of operations."

The €60 million-odd annual revenues associated with the MaSa extension will be a major boost to the French company's plans announced last year to double its international revenues to €380 million by 2023 (*see GWI June 2019, p32*). While the company has outlined a number of targets around the world, and made a move into a Latin America with the acquisition of Colombian concessionaire Naunet last year, the Middle East is expected to be the engine room of international growth.

"We are still aiming for this €380 million figure, and if we can do better that's great," Vivant said. "The integration in Colombia is going very well and we already have a pipeline of exciting opportunities. But the Middle East and the Gulf countries in particular are going to be one of the main platforms for Saur."

One key road to reaching the target will be the municipal "management, operations and maintenance" regional cluster contracts being rolled out by the National Water Company (NWC) in Saudi Arabia. The NWC is looking to integrate the private sector in every part of the water asset management process around the country through the 5- to 7-year management contracts ahead of a planned shift into full commercial concession-type structures for the country's utility services.

Saur, alongside its partners Miahona and Manila Water, submitted an offer for the first of these management contracts, covering the North West region of the country, at the end of January. Vivant said that the company hoped its track record alongside Marafiq, as well as its earlier experience offering management services in the cities of Mecca and Taif, would put it in good place as it waited for a reply from the client. ■

KUWAITI PPP

WTE reaches finish on Kuwaiti PPP

After nearly a decade of procurement, the Umm Al-Hayman independent wastewater treatment plant has reached financial close.

A team led by Germany's WTE Wassertechnik has secured financial close on one of Kuwait's most prominent PPP projects – nearly a decade after the project was first launched.

The 500,000m³/d Umm Al-Hayman plant will be developed by a team comprising WTE and International Financial Advisors (40%) alongside the Kuwait Investment Authority (10%) and central PPP body KAPP (50%).

Financial close secured at the end of January marks an end to a protracted procurement process for the plant, which first started in 2010. Financing for the treatment plant is understood to be on a 80:20 debt-to-equity basis, with a consortium of six banks providing a $650 million, 26-year debt package: Al Ahli Bank of Kuwait; Commercial Bank of Kuwait; DZ Bank; KfW IPEX-Bank; Korea Development Bank and Siemens Bank. There is also a treated sewage effluent infrastructure element of the project that is being funded directly by the client, the Ministry of Public Works.

Despite some major breakthroughs, PPP projects have struggled to keep pace in Kuwait as politicians disagree over the use of the model. As a result a number of key projects have been held up.

Investors will eventually have the chance to bid for the 50% KAPP stake in Umm Al-Hayman when it is floated on the stock exchange following construction, in the mould of the Az-Zour North 1 IWPP last year (*see GWI September 2019, p15*). ■

AFRICAN UTILITIES

Kenya asks for help with performance-linked NRW contracts at group of utilities

Consultants are being sought to work with six utilities all trying to tackle the perennial issue of non-revenue water.

Kenya's regulator, the Water Services Board (Wasreb), has issued a request for expressions of interest from consultants to assess the suitability and design of performance-based contracts (PBCs) to reduce non-revenue water (NRW) at six utilities.

NRW is an ongoing issue in Kenya where it has averaged 42-45% in the last decade, despite significant efforts to address it. A 2018 audit of select WSPs commissioned by Wasreb indicated that 64% of NRW in Kenya was physical losses and 36% commercial losses. The report also found that despite the development of NRW management guidelines, their implementation among utilities was very low.

The studies are being financed by the World Bank and supported by the bank's 2030 Water Resources Group (2030WRG). Joy Busolo, Kenya country coordinator for 2030WRG, told GWI that the idea of looking at PBCs was to incentivise a sector shift towards output-oriented programming rather than activities/input-based EPC contracts. "The PBC model's value proposition to [utilities] in Kenya is that performance risk is transferred to the external contractor and remuneration is based on the achievement of performance targets," she said. "In addition, it enables for the leveraging of private capital to complement scarce public resources."

The utilities taking part in the pilot - Nyewasco (Nyeri), Nawasco (Nanyuki), Naivawass (Naivasha), Kacwaso (Kakamega), Eldowas (Eldoret) and Nawassco (Nakuru) – which are mostly average NRW performers, save for Nyewasco, were selected through a screening process by Wasreb. Busolo said that they are broadly representative of the challenges utilities face nationally.

The consultant is expected to assess the suitability of PBC to address NRW at each utility and to come up with a PBC project scope. Broadly speaking, the contracts will include two components: a fixed fee covering capital expenditure such as the creation of district meter areas, improvement of pressure control, repairs of leaks/connections, replacement of pipes etc., and a performance-based O&M fee to implement NRW reduction targets. Contracts are likely to be 4-5 years.

In a bid to ensure there is enough interest from the private sector, 2030WRG will organise a market sounding roundtable in 2021. "[This is] to gauge investor interest in the proposed projects and inform risk allocation approaches to NRW-reduction PBCs to ensure the transaction is consistent with private sector appetite and lender requirements," says Busolo.

PBCs are new to the water sector so 2030WRG will provide support to the utilities involved in the pilot; it will also help Wasreb develop a national strategy for PBCs.

Interested consultants have until 23 March to submit their expressions of interest. Following this, Wasreb then expects to issue the final RFP to shortlisted companies in April, with a submission deadline of late June and a contract award in late 2020. ■

CAPITAL FINANCE

Saudi Arabian desal giant takes on debt for the first time

The Saline Water Conversion Corporation has taken on a $430m bridging loan – its first-ever deal with private banks. The timing of the arrangement is interesting.

Saudi state-owned desalination body the Saline Water Conversion Corporation (SWCC) has signed a first-of-its-kind deal with private banks to top up its capital spending plans.

In the closing days of January, the body signed a SAR1.6 billion ($430 million) bridge financing deal with Banque Saudi Fransi and Saudi British Bank to create funds that will be used to support the construction of its Jubail 1 and Khobar 2 'replacement' contracts, where ageing thermal plants in SWCC's colossal portfolio will be shuttered in favour of newly-built membrane facilities.

SWCC remains one of the largest desalination companies in the world, with an operating portfolio in excess of 5 million m^3/d, but its role procuring new assets has largely been usurped by the country's PPP programme (*see story p10*). However, despite the Kingdom's stated goal of having all greenfield spending funded by private finance, SWCC has continued to award contracts, either through smaller-scale focused satellite plants, or under the guise of 'replacement' projects. It is currently trying to push out two more projects at Shoaiba and Shuqaiq that will comprise a combined 1 million m^3/d capacity but procurement has been repeatedly held up.

SWCC and its contractors claim that the publicly funded approach can offer better value for money and lower energy costs than the PPP programme that has grabbed the headlines (*see GWI April 2019, p12*). They also offer a chance to lower SWCC's operating costs - it estimates upgrading all its portfolio could save up to SAR1.25 billion ($333 million) a year in energy and operating costs.

However it needs to find the capital budget to support these building plans. While it receives payments for bulk supply of water and electricity generated at its plants, its budget in the past ahve been largely supported by the government, which is now fully behind the deveopment of the water PPP programme, represented by the Saudi Water Partnership Company.

Construction work at the Jubail and Khobar plants can now go ahead. with the signing of the SWCC finance deal. GWI understands that China's Sepco III and Acciona are the lead contractors for the two projects, respectively. ■

UAE WATER ASSETS

Abu Dhabi plans major water asset reshuffle

By moving all its water assets to the control of part-listed group Taqa, the emirate aims to create new ways to raise finance effectively.

Ratings agency Moody's has placed Abu Dhabi desalination asset holder Taqa under review for upgrade after the emirate shifted almost its entire utility asset base to the body.

The state-owned Abu Dhabi Power Corporation (ADPower) announced in February that it would be moving the vast majority of its water and electricity generation, transmission and distribution assets to the Abu Dhabi National Energy Company, better known as Taqa (*see chart, below*). In exchange, Taqa will issue 106 million new shares to ADPower that take the body's holding in Taqa from 74.1% to 98.6%.

It means that the emirate's state-owned stakes in public-private water and power plants will now be unified under a single body, alongside the transmission and distribution assets that were previously held by ADPower direct subsidiaries. The one exception is bulk water purchaser and supplier EWEC, which has a federal remit that gives it responsibilities out side Abu Dhabi.

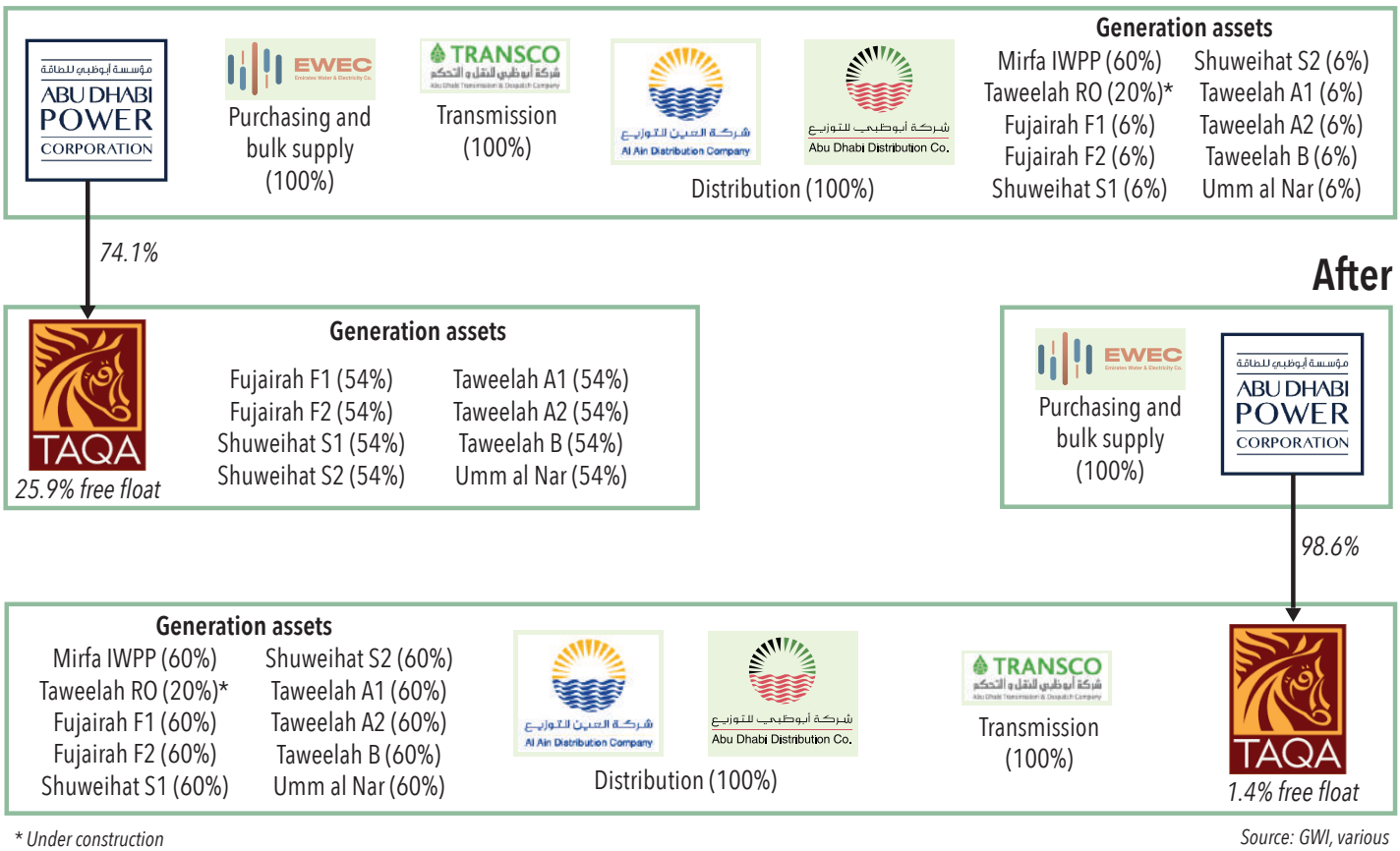
Following approval of the deal, expected in the middle of 2020, the 25.9% slice of Taqa currently floated on the Abu Dhabi Exchange would shrink to represent just 1.4%. However the emirate has indicated that a further rights issue could be on the cards following completion, giving investors a chance to put money into what would likely be the world's largest publicly listed listed water utility company.

As well as offering the chance to raise money from a rights issue, the emirate also hopes that by creating a vehicle with such a large and stable asset base, it will be able to raise money from debt at more reasonable rates through corporate bond issues or commercial loans.

The move from Moody's was the first indication that this strategy could pay off. The agency placed all of Taqa's ratings on review for upgrade, including its current A3 long-term issuer rating and P-2 short-term issuer rating. The agency said that as well as consolidating the generation assets, it would also insure against fears of losing long-term purchase agreements, and balance out the instability of revenues from the oil & gas investment wing of the group, which have performed poorly in recent times as a result of volatile energy prices. ■

WHAT IS HAPPENING TO ABU DHABI'S WATER UTILITY ASSETS?

The reorganisation of Abu Dhabi's utility structure and asset-holding bodies has created a listed vehicle with assets valued in the region of AED200 billion ($55 billion). While the current free float is a minimal 1.4% after the restructuring, the Abu Dhabi authorities have hinted that this could be set to increase.



** Under construction*

Source: GWI, various

MIDDLE EAST IN BRIEF

- The **European Investment Bank** has approved a €35 million loan to Madagascar for its Jirama Water III project, which seeks to improve drinking water supply in the capital Antananarivo. It is complemented by a €30 million grant from the European Commission, and a €2.5 million grant from non-profit organisation Water and Sanitation for the Urban Poor. The latter has been working with national utility Jirama for 10 years and helped prepare the project.

- Meanwhile in early February the EIB also signed a €120 million financing agreement with Egypt to support the expansion and upgrade of the Alexandria West wastewater treatment plant. Both the Egyptian and Alexandrian projects fall under the EIB's expanding remit outside EU member states (*see story p18*).

- Egypt's **Ministry of Housing, Utilities and Urban Development** has signed a memorandum of understanding with Saudi project developer **ACWA Power** aimed at encouraging the firm to invest in renewable-power desalination projects in the country.

- Concentrated solar power desalination specialist **Solar Water Power** secured a contract to build a solar still at the Neom development in Saudi Arabia. The UK-based company also secured a contract to supply its desalination 'solar dome' to a facility run by the Jordan Phosphates Mines Company in Aqaba.

- The **World Bank** has committed to providing a $15 million grant to support the transmission and storage of water from the proposed 150,000m³/d Gaza desalination plant. Funding from the world bank will be matched by $42 million from 10 national donors and $60 million from the **Kuwait Fund for Arab Economic Development**.

- The **Water Authority of Jordan** is looking to take on a consultant to work with it on a **KfW**-backed feasibility scheme investigating the possibility of developing new groundwater desalination facilities in the county. The deadline for submissions for the project is 23 March. ■

COMMENT

Why wastewater is more fun than desalination for PPPs

Privately financed desal seems locked in a spiralling price war, but the slow process of wastewater contracts hides a much more complex situation, says Tom Scotney.

In this column a year ago I said there was only one thing that would stop the continuing drop in the prices of privately financed desalination projects – the collapse of a major project (*see GWI February 2019, p41*). I said the temptation to win projects of this size, combined with the sheer number of potential developers out there would mean there would always be someone willing to take a punt on a low margin if it meant they thought they could get a foot in the door of the biggest market for capital projects of these type in the world.

One year on and we haven't had a project collapse – and we haven't seen a letup in cut-throat pricing either. For sure, the number of bidders has waned for more recent projects that have come to the market, but the clients still seem to be able to marshal enough interest that they can tease out an ultra-low bid from one that will set the pace for the rest of the pack to match or beat.

The situation is rapidly speeding out of control. An article being written for this issue of GWI about how the Yanbu 4 bids were setting a new low benchmark for desalination had to be altered on the day GWI went to press as it became apparent that the bids for the next plant at Jubail would likely set a new new benchmark. One source described it as a "rush to suicide".

But despite all this desal drama it's actually two developments in the wastewater markets that have caught my eye most this month – one broadly positive and one broadly worrying.

The Metito-led team was given the notice to proceed on the Dammam West independent sewage treatment plant (ISTP) on Saudi Arabia's Gulf coast, which should mean that financial close is imminent on the project, more than a year after the service agreement was signed. For a process that can take a matter of weeks for desalination project developers, financial close has been an elusive target for those bidding on the first wave of Saudi ISTPs. None has yet reached financial close.

A note of caution will be sounded by the news of financial close at a different ISTP, the Umm Al-Hayman project in Kuwait. This finally crawled over the line this month, nearly ten years after procurement first started. Kuwait has its own issues with PPPs for sure, but the general delay on wastewater projects makes it difficult for the process to establish a baseline for what counts as reasonable pricing.

This is already a difficult issue for the wastewater industry. The business of wastewater treatment has not become as commodified as desalination, where technical innovation on large-scale projects is largely restricted to finding new ways to incorporate cheap energy sources.

In wastewater treatment the technical options are far more diverse, and the number of regulatory agencies involved more numerous, and that's reflected by the extra difficulties of securing financial close.

The slow pace may be a good thing in the long term for the wastewater PPP industry, as the more opaque approach to pricing might make it harder for the industry to get caught up in the kind of spiral that seems to be the case for the desal industry a the moment.

But still, to make progress, one of these projects has to close, and when it happens it will be a major cause for celebration from both clients and project developers.

That's why I'll be following the wastewater treatment PPP bidding with perhaps even more interest than the desal bidding.

This month the Saudi authorities issued a request for qualifications to the predictable rush of dozens of companies that had expressed interest in its second round of ISTPs. The number of serious bidders that emerge for these projects will tell us whether wastewater pricing can follow the rush seen in the desal pricing business – and whether that'll be a rush to suicide, or something more sustainable. ■

WASTEWATER FINANCING

NIB blue bond proceeds drive advanced treatment build-out

Despite boasting some of the world's most advanced wastewater treatment facilities, Nordic countries are still picking up their spending. The regional investment bank is a key driver.

As the pace of spending for advanced wastewater treatment in Nordic countries picks up, the Nordic Investment Bank (NIB) has celebrated a successful first year in 2019 for its Nordic-Baltic Blue Bond that is backing many of the region's most exciting projects.

The Blue Bond is an SEK2 billion (€190 million) initiative set up to fund wastewater projects in the region over a five-year period. The NIB's Environmental Bond Report published late last month revealed that the funds have so far been allocated to eight projects, with a total investment of €182 million. In 2019, 40% of blue bond disbursements went to projects in Sweden, 34% in Norway and 26% in Finland.

These include WWTP upgrades at Uddebo, Getterö (Sweden), Vestfjorden Avløpsselskap (Norway) and Kakolanmäki (Finland), as well as wider projects to improve municipal wastewater infrastructure such as Mäntsälä (Finland) and Tanum (Sweden).

The launch of the bond comes as part of a widespread acceleration of wastewater spending across the region. In the face of growing urbanisation, ageing municipal infrastructure and increasingly stringent environmental regulations, Nordic countries are gearing up for a new wave of investment.

Johan Ljungberg, chief environmental analyst at the NIB, told GWI that in the short to medium term, the investment shows no signs of slowing down. "I think we'll have a growth in investment over the coming twenty years", he said. "There are estimates saying at least 35% up from today's investment for a number of years going forward."

Nordic countries have built swathes of advanced wastewater treatment projects in the past few years, but despite already operating advanced levels of wastewater treatment and almost blanket compliance with the EU Urban Wastewater Treatment Directive, spending is set to continue.

Part of the investment increase stems from a push towards centralisation. Demolishing ageing treatment plants and replacing them with centralised, often underground, facilities allows land to be repurposed. The Käppala WWTP, in Sweden, and the Vestfjorden Avløpsselskap plant in Norway are two of the region's biggest central WWTPs, both built underground near a major city. Similar designs have been adopted in Finland for Espoo's Blominmäki WWTP near Helsinki and the €300 million Tampere Central Plant, both under construction.

Ljungberg highlighted that urbanisation is one of the key factors behind the trend. "This is driving more capacity increases in new areas and residential areas", he explained, "and we also have to connect more single households to the central wastewater treatment plants, and that is quite big".

The latest figures from Eurostat reveal that Sweden, Norway and Denmark will see some of the most significant spikes in population by 2050 among European countries. For municipalities, growing urbanisation presents a serious challenge to maintaining sufficient wastewater coverage in future years.

In addition to expansion, much of the funding is aimed at modernising outdated wastewater infrastructure. Most of the region's wastewater networks and treatment capacity were built up in the 1960s and 70s, while the following decades saw little investment, Ljungberg explained. As a result, this infrastructure "needs to be replaced at a much higher speed today." In many cases, refurbishing wastewater networks represents the most pressing case for increased investment.

Moreover, tougher environmental regulations on wastewater are mandating municipalities to upgrade their WWTPs in line with the new requirements, opening the market for advanced technologies, particularly for removing nitrogen and phosphorus.

"The organisations of the different municipalities will face all sorts of challenges going forward", Ljungberg explained, "they have to ramp up their investment, they need more project management, they need more procurement".

However, one difficulty municipalities are encountering in upgrading WWTPs is that they require a land permit, granted by national environmental authorities, but "from the application to the granting of the permit it can easily be a year and a half."

This processing time is causing a backlog of applications, causing many projects to fall into an 'in-between' stage where an upgrade is planned, but a tendering process cannot yet go ahead. Furthermore, a consequence of such widespread investment is that environmental authorities are "overwhelmed" by the number of applications they have to process, Ljungberg said.

Commenting on the geographic spread of the NIB's projects, Ljungberg stated that investment was not just aimed at the major cities: "For instance, we have planned money to cities with a population of about 100,000 and delivery operators up in northern Sweden," he said.

Neither is the spending isolated to one country; the NIB is planning to fund wastewater projects across Sweden, Finland, Norway and Denmark, and even the Baltic nations are beginning to see approved loans. "So it's coming," he said, "it's not just the big ones, not just the capital cities." ■

JOHAN LJUNGBERG

The Nordic Investment Bank's chief environmental analyst tells GWI that the pace of spending on Nordic wastewater treatment is set to grow over the next 20 years.

Source: NIB

This month in Europe:

EU FINANCE

European Investment Bank water lending moves ahead of the climate curve

Ahead of the Madrid climate conference last year, the European Investment Bank increased its targets for climate change-related commitments to unprecedented levels. Water is already ahead of the curve, as GWI's exclusive access to detailed 2019 figures reveals.

New figures from the European Investment Bank's (EIB) water lending team reveal that the sector will be a key asset in getting the Bank as a whole to reach its latest goals in the fight against climate change.

Last November, the EIB unveiled new ambitions for its contribution to the global climate agenda, aiming to raise the level of targeted financing for climate action and environmental sustainability to 50% of its total activities by 2025. The water sector is almost certainly already there.

Figures for "environmental sustainability" as distinct from climate action will only be available from next year, Karine Méasson, who heads the Bank's water management division, explained to GWI this month, but the share of EIB water lending contributing to the climate agenda alone reached 40% in 2019, compared to 31% for the Bank as a whole. It is not a stretch, given the high environmental value of any wastewater project, to assume that climate action and environmental sustainability put together already exceed the 50% threshold in the water sector.

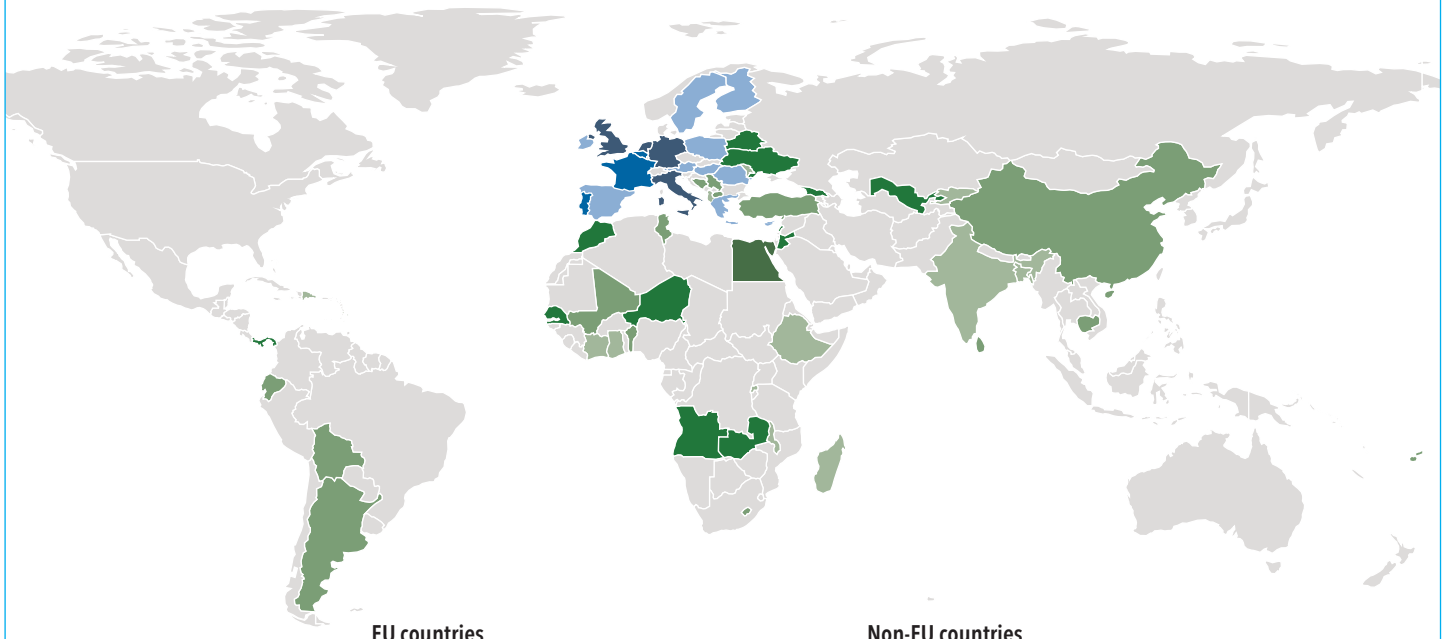
> "We have very good results in terms of adaptation [to the effects of climate change]. Water sector operations represent roughly 50% of the EIB's adaptation volume."
>
> Karine Méasson, head of the EIB's water management division

"We have been selecting many of our operations so as to focus them on such climate intervention," Méasson said. "We especially have very good results in terms of adaptation [to the effects of climate change]. Water sector operations represent roughly 50% of the EIB's adaptation volume."

Indeed, recent EIB loans have proved crucial in catalysing adaptation efforts both in and outside the EU. Projects such as the reinforcement of the Netherlands' Afsluitdijk, a 32-km dyke closing off the freshwater IJsselmeer from the North Sea, to better cope with rising sea levels, or building two CSO tunnels in Lisbon (*see Project Tracker, p51*), seek to protect Europeans from increased flood risk from sea or sky. As far afield as Bolivia, the EIB is also con- ▶

EIB WATER COMMITMENTS AROUND THE WORLD (2015-2019)

The European Investment bank has increasingly found a purpose for its water lending outside Europe, a trend that has picked up in the last two years. Africa has proved a particularly fertile ground for water investment.



Source: EIB

tributing to building reliable water supply infrastructure in areas struck by intense, climate change-driven droughts. In Rwanda's capital Kigali, meanwhile, the country's first ever wastewater treatment plant will reduce emissions of methane, a powerful greenhouse gas, from the city's septic tanks and latrines – a classic example of climate change mitigation.

Beyond the issue of climate change, the EIB's water team has also been mobilised on the Bank's new Clean Oceans Initiative, in partnership with the German and French development funds, KfW and AFD. "As far as the water sector is concerned," Méasson explained, "the idea is to develop proper management of the significant amount of plastic waste collected in wastewater treatment plants, including microplastics" in order to prevent this plastic from being carried off by rivers into the ocean.

"Plastics are mainly an issue outside the EU," said Marco Beroš, the water division's lead engineer, "where you have beaches polluted by enormous quantities of plastic waste – not just microplastics but mostly macro-plastics, bottles or other forms of packaging. This is the concern that prompted this Clean Oceans Initiative."

Actions to protect biodiversity in the EU are also being introduced through the Commission's Natural Capital Financing Facility (NCFF). The NCFF provides grants which are partly channelled through EIB projects "to finance more biodiversity projects or biodiversity components in the projects that we finance," Méasson said. "This is something that we would really like to see increase over time," she added.

For instance, an upcoming €330 million investment loan with Walloon wastewater utility SPGE in Belgium includes €6 million earmarked under the NCFF. "We have asked the developer to identify all the little schemes that have a biodiversity component," Beroš explained. "That is, for example, reedbed WWTPs, green roofs, greening or planting asphalted areas. It's something we are doing for the first time in the water sector, and we hope we can replicate it with other clients, because we often have these kind of big investment programmes where small fractions are linked to biodiversity, like river renaturation."

A portion of the funds used by the Bank to finance water projects in Europe and beyond are raised through so-called Sustainability Awareness Bonds (SABs), inspired by Climate Awareness Bonds (CABs). "There is a lot of demand for bonds with a more social or environmental angle rather than just climate," argued Thomas van Gilst, head of the water security & resilience division. "The SABs are similar to existing CABs, but angled around SDGs."

"We are tracking all our investments that make a significant contribution to SDG6 [clean water and sanitation]. For the €500 million we raised in the first bond issue, we have already identified more than €500 million's worth" of these projects, he added. "The interesting thing is that you develop awareness among the investing community, rather than the lending or granting community" so that the latter can increasingly count on the former for capital. ■

EU WATER LENDING

EIB water lending remains stable in 2019 as EU budget cycle winds down

Lending to countries outside the EU has replaced a dip in intra-Union funding.

The European Investment Bank's (EIB) lending commitments in the water sector in 2019 hovered around the same levels as in the previous year, with a total of €2.5 billion worldwide and a near-50-50 split between EU recipients and the rest of the world *(see chart, below)*. This represents a markedly lower level of investment in EU member states compared with the years prior to 2018.

Karine Méasson, head of the EIB's water management division, explained to GWI that this is not necessarily indicative of a long-term trend, however. "A large part of our activities in the EU is managed in the framework of our relations with EU institutions and the Multi-annual Financial Framework [MFF]," she told GWI this month. The MFF is the EU's seven-year budget. It is possible, she argued, that the lower lending volumes in the EU in the last two years could be related to "an end-of-period effect, as the current MFF runs from 2014 through 2020."

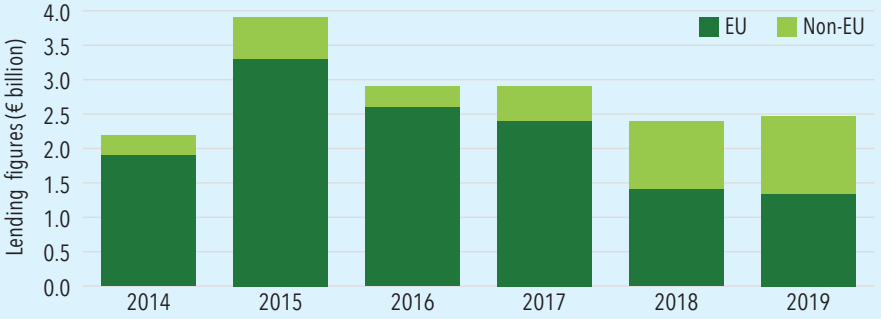
This may mean that, once negotiations on MFF 2021-2027 are concluded, EIB lending could pick up in support of projects stemming from the Commission's many funding programmes. This would mirror the middle of the last decade, when the start of the current MFF fuelled a dramatic rise in signatures between 2014 and 2015.

Brexit is also having an impact, as loans to the UK water sector used to make the former member state the single largest recipient of EIB water finance. Since the UK voted to leave the EU, the Bank has refrained from making new commitments in the country until a new relationship is agreed as part of broader negotiations with Westminster.

As for lending outside Europe, added Thomas van Gilst, who heads the water security & resilience division, "it's quite bulky. If we happen to sign a few big operations in one year, the figure bumps up, so it is hard to draw a trend from it." He went on to explain that recent years had seen "a push we did on technical assistance" – grant money – "and some projects which flow from this technical assistance are quite massive." ■

EIB WATER LENDING (2014-2019)

Commtiments to the water sector are relatively stable year-on-year for the EIB, but cyclical factors are incurring lower investment in member states compared to a few years ago.



Source: EIB

UK PRICE REVIEW

Four appeal Ofwat's PR19 price settlement

A record number of UK water companies have elected to refer their proposed price settlements for 2020-2025 to the competition authority. Is it an exercise in futility?

Ofwat is facing the biggest challenge to its authority since privatisation, after four UK water companies announced that they are seeking to overturn their financial settlements for the next five years.

The quartet includes three of the ten large water and sewerage companies (WaSCs) – Anglian, Yorkshire, and Northumbrian. It is the first time since 1995 that a WaSC has asked for its final price determination to be referred to the relevant competition authority.

Bristol Water also requested that the Competition and Markets Authority review its final determination for AMP7 – the third time in as many reviews that the water-only business has taken this step.

Despite the unprecedented number of requests for referrals (*see table, right*), there is no suggestion that the weight of objections will persuade the regulator to back down.

"We are fully ready to engage with the CMA, setting out our analysis and why we are confident that this is the right settlement for customers," insisted Ofwat chief executive Rachel Fletcher. She added that some investors in the sector should "face up to the new reality" that in future, rewards would be conditional on improvements in performance.

The scene is consequently set for the biggest regulatory confrontation since the industry was privatised in 1989.

"It's clearly a challenge to Ofwat, and the regulator will do its damnedest to make sure its settlements remain intact," commented Tom Sharpe, a QC who specialises in competition law, and who has acted for the water regulator in the past.

Multiple challenges to the final determinations were widely predicted this time round, given the considerably tougher financial regime that the regulator was always going to impose on the sector in AMP7. How successful the appellants will be in persuading the CMA that Ofwat has gone too far, however, is much less certain.

Not only have rulings from the CMA and its predecessors in past referrals been noticeably closer to the regulator's final determinations than the companies' final business plans, but the sector is currently held in low public and political esteem. This has led some, like Sharpe, to believe the outcome is a foregone conclusion. "I don't think the regulator can lose on this," he told GWI this month.

The result will largely depend on whether the CMA accepts the argument that Ofwat's cuts to allowable expenditure will prevent companies from meeting stated customer priorities, while at the same time posing a threat to their long-term financial resilience.

The expenditure gap between business plan and final determination is greatest at Anglian, where the company proposed a total investment of £6,460.5 million in 2020-2025, while Ofwat determined that it only needed to spend £5,712.7 million. The £747.8 million differential would oblige Anglian to cut its average household bills over AMP7 by 10%, instead of by just 1%.

Chief executive Peter Simpson insisted that the company's plan is essential in order to meet the region's specific challenges of population growth and climate change, and stressed that it enjoys "wholehearted" customer support. Delaying the investment would simply impose higher costs on customers in future, he argued.

"I think they believe they've got a genuine case," commented independent sector analyst Robert Miller-Bakewell. "They were certainly emphasising on their conference call that Ofwat had ignored the customer feedback."

Northumbrian and Yorkshire also maintained that their final determinations would leave them unable to meet their customers' stated priorities, while posing a threat to long-term financial resilience.

"They're going to the CMA on issues where they hope they might get some relief," noted Lakis Athanasiou, utility analyst at Agency Partners. "But I still think there's an element in this of management wanting to be seen by their shareholders to be doing something, however futile."

Two other WaSCs, Thames and Southern, confirmed that they had given serious thought to seeking CMA referrals before ultimately deciding to accept their final determinations.

While both cited potential management disruption and costs as reasons, their poor regulatory record – Ofwat has imposed penalties of well over £100 million on each of them within the last two years – may have been a more decisive factor. "I think their decision reflected the reality that they have a credibility problem," observed Miller-Bakewell. ■

SWINGS AND ROUNDABOUTS

UK water companies have had limited success in convincing the competition authority that the regulator's price settlements are flawed. An unprecedented number of appellants in 2020 could shake things up.

Year	Company	Arguments/outcomes
2020	YorkshireWater, NWG living water, anglianwater, BRISTOL WATER	A common theme of the appeals is that cuts in allowable expenditure versus business plans will leave companies unable to meet customer priorities, and pose a threat to long-term financial resilience
2015	BRISTOL WATER	Slight reduction in required tariff cut (19% to 16%); small increases in totex and WACC (3.6% to 3.67%)
2010	BRISTOL WATER	15% increase in tariffs over period (against 7% in final determination); reduction in allowable WACC (5% against 5.5%)
2005	-	No companies appealed
2000	mid kent water, ses WATER	Mid Kent: Lower average tariff cut (2.8% vs. 4.0% in FD) Sutton & East Surrey: Lower average tariff cut (2.5% vs. 5.1% in FD)
1995	South West Water, Portsmouth Water	South West Water: Tighter curb on tariff rises/slight increase in capex Portsmouth Water: Ofwat price cap broadly upheld

Source: Companies / MMC / Competition Commission

SLUDGE MANAGEMENT

Flemish sludge project rekindles hope for Benelux water PPPs

Nearly twenty years after Belgium's last water PPP was signed, Flemish utility Aquafin is out soliciting bids for a sludge treatment BOT. The project may inspire others in the region to follow suit.

Aquafin, the wastewater utility serving Flanders, Belgium's Dutch-speaking region, has unveiled plans to contract out the design, construction, financing and long-term operation of a new processing plant which will handle two-thirds of the region's sewage sludge.

The project will centralise the management of dewatered and dried sludge which has already been digested at individual WWTPs, and represents the first water-related PPP in the Benelux since the Harnaschpolder wastewater project reached financial close in 2003.

Total expenditure on the project is expected to amount to between €150 million and €175 million, and statements of qualification must be submitted by 9th March.

"Currently, one-third of our sludge goes to the cement industry, one-third to an external co-incinerator with industrial and household waste, and one-third to our mono-incinerator in Bruges," explained project manager Sam Geerts.

With the Bruges incinerator due to be take offline in 2026, and given looming uncertainties regarding the future of Belgium's cement industry after 2030, the new sludge processing plant will effectively replace two of Aquafin's three current disposal routes.

The Flemish utility has been innovating in the field of sludge management for some years, having piloted struvite recovery from wet sludge and established biogas generation through anaerobic digestion as standard practice at its WWTPs. The new sludge management facility will go one step further.

"We want to grasp all the knowledge from the market," Geerts asserted, adding that the goal is to assess potential improvements on, or alternatives to, mono-incineration (the practice of incinerating sewage sludge without mixing it with other waste streams).

Admitting that it lacks the in-house expertise to design a plant of this sort itself, Aquafin wants to rely on the private sector's technical know-how to design, build and operate the new facility, instead of going down its traditional route of drawing up detailed specifications, then contracting out the individual elements of a project such as this.

To this end, Aquafin intends to engage in a "competitive dialogue" process with prospective bidders, to establish with each of them how best to design the new plant as a whole. "We plan on having two or three rounds" of discussion ahead of an award in the second half of 2021, said Geerts, noting that unsuccessful bidders will receive financial compensation.

The structure of the financing package remains fluid, although it is likely to carry a debt-to-equity split of around 80:20. The debt component is likely to be provided by commercial banks, while Aquafin is considering taking a 25% stake – alongside the private sector – in the special purpose vehicle that will develop the project.

In terms of the project's cash flows, revenues will be generated either by charging a "gate fee" per ton of sludge processed, or else through the payment of an availability fee, which will be levied on a quarterly basis.

The facility will be powered by waste heat generated from the treatment process, and will only accept dried or dewatered sewage sludge from Aquafin's WWTPs, while excluding household or industrial waste. This is to make it easier to recover phosphorus from the ash at a later stage, although a phosphorus recovery step will not be included in the initial project scope. The reason for this is a financial one, Geerts explained. Because Aquafin estimates the phosphorus recovery rate from its sludge to be just below economic viability, including it in the present project "would increase our risk and therefore our financing costs quite a bit. We want to separate the two projects into one higher-risk investment [a P recovery facility], and one somewhat lower-risk investment [the main sludge treatment plant]."

The project is already said to have attracted interest from a Dutch utility, raising the prospect of a renaissance in the market for Benelux water PPPs. ■

FEELING THE BURN OF INCINERATION

Aquafin's sewage sludge incineration plant in Bruges is set to be decommissioned in 2026, paving the way for a state-of-the-art sludge processing facility with the potential for phosphorus recovery.

Source: Aquafin

EUROPE IN BRIEF

- UK water companies made a bold return to the debt capital markets this month in the aftermath of Ofwat's final determinations for the forthcoming five-year asset management period. Fresh from a double credit rating downgrade from Moody's and S&P, **Welsh Water** raised £500 million of senior and subordinated capital, while **United Utilities** borrowed £250 million over 18 years, with a coupon of 1.75%.

- **Severn Trent Water**, meanwhile, was downgraded from A3 to Baa1 by Moody's after the company accepted Ofwat's final price determination and announced that it would aim to grow dividends at least in line with the CPIH index over the course of AMP7.

- Moody's was also active in Spain, changing its outlook on Madrid's water utility, **Canal de Isabel II** to positive from negative. The move followed January's bondholder decision to resolve an event of default under CYII's €500 million February 2025 bond.

- Danish pump manufacturer **Grundfos** has signed a strategic partnership with data analytics company **Augury** in order to develop smart diagnostics solutions for water.

- Finnish chemicals company **Kemira** had a softer than expected Q4, which it blamed on shale market weakness and new plant start-up costs. At the same time, the company announced its ambition to become carbon-neutral by 2045.

- German chemicals company **Evonik** finally closed its $640 million acquisition of **PeroxyChem** this month, following a dismissal of the US Federal Trade Commission lawsuit which had sought to block the deal.

- The **EBRD** priced its largest single-tranche green bond earlier this month, in the form of an upsized $925 million 5-year deal carrying a coupon of 1.5%.

- Embattled water tech company **Modern Water** priced 370 million new shares – amounting to nearly 300% of its previously outstanding share capital – to raise just £1.68 million earlier this month. ■

COMMENT

Utility investment in 'soft' assets brings solid benefits

Environmental remediation can pay off for both the natural landscape and the bottom line for under-pressure water service providers, says David Lloyd Owen.

The case for addressing degradation of the natural environment is not just a green matter – it is becoming increasingly obvious that it is a financial matter for water utilities too.

Using 'ecosystem services' (the expression 'nature-based solutions' could only have been dreamed up by a second-tier management consultant) for improving the management of water resources may appear to be counter intuitive in a period when we are getting to grips with what smart water approaches can offer.

Because we are not dealing with 'hard' assets (which companies can get a return on) they tend to be overlooked. Fully costed case studies are a rarity and this needs to be addressed, as the concept has much to offer across a dense and denatured Europe. There are three ways in which they may be deployed.

The simplest is catchment maintenance, by maintaining a habitat's integrity so that it continues to provide its ecosystem services. This may involve subsidies to landowners and farmers to minimise the impact of their operations or to acquire the land so that it is not subsequently developed. In 2015, $23.9 billion was spent on watershed protection globally, covering 487 million hectares.

The next stage is catchment restoration. If habitat has already been degraded it can be restored to its 'natural' state through ceasing to use it in a deleterious manner or by an active management plan based on replacing modified or damaged elements with elements that would naturally occur. Pennon-owned South West Water (SWW) has restored 3,236 hectares of moorland and culm grass reviving their water holding ability and reducing particulate loading downstream. They are currently restoring 1,680 hectares of degraded peatland. By working with 1,290 upstream farms on riverbank restoration, pollution and particulate loadings are reduced. SWW believes the returns in terms of less treatment and water holding capacity needed can be ten times the investment.

Finally, there is the finest form of flattery, catchment mimicry, which involves replicating natural processes in urban or peri-urban settings so that they perform 'green' ecosystem services in lieu of the traditional 'grey' water management infrastructure. The best-developed area is in deploying sustainable urban drainage systems. Installing permeable pavements and bioswales (vegetated runoff channels) in Portland, Oregon reduced peak stormwater runoff by 80-94% at a cost of $9 million against the budgeted $233 million in 'hard' stormwater systems. Likewise, New York installed 'green' stormwater management systems for $2.4 billion, saving $1.5 billion in the long run.

The upland example is about quantity as well as quality. Restoring an ecosystem's absorptive capabilities reduces the impact of heavy rainfall (there have been three 'one-in-a-hundred-year' floods in the river far below our house in the past 14 years) and maintains stream flow during dry periods. As healthy peatlands are also carbon absorbers, this is a truly holistic response to climate change.

Perhaps the best way is to regard our natural resources is as a sixth layer in a smart water network. Managing upstream assets for example in a smart manner makes the smart network smarter still. Using real-time monitoring of upstream flow and water quality is the next step, quantifying the impact of habitat restoration can be brought into overall water systems management, bringing the monitoring of hard and soft assets together.

This is not about re-wilding for the sake of re-wilding. We remain too ignorant for such approaches. Just last year it was realised that extensive tree planting was causing streams to dry up. Trees do tend to be thirsty. Working with nature requires nuance, it is not something that exists for us to impose our fantasies upon.

In the meantime, coming up with a more elegant name (something along the lines of 'ecosystem services' or 'natural capital' perhaps) would be a good thing. This is because in water, quality matters, as well as quantity. ■

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POTABLE REUSE

Oceanside sets the pace for IPR in San Diego County

A new advanced water purification facility in Oceanside will be the first of its kind when it comes online next year. It foreshadows a series of much larger projects.

This month in the Americas:

The City of Oceanside broke ground on its 4.5MGD (17,000m³/d) advanced water purification facility on 19 February, which will be the first commercial-scale indirect potable reuse (IPR) project in San Diego County when it comes online in 2021.

Building on the success of projects such as Orange County's Groundwater Replenishment System, the Oceanside facility foreshadows a series of larger initiatives in San Diego County, including the 83MGD (314,190m³/d) Pure Water San Diego project and the 11.5MGD (43,528m³/d) East County Advanced Water Purification Project.

"The City Council has a goal to produce 50% of our water supplies locally by the year 2030, so this particular project, in combination with our recycled water project components, will get us there," said Cari Dale, utilities director at the City of Oceanside. "It helps to shore up our ability to produce water from the Mission Basin aquifer well into the future."

Oceanside currently imports nearly 90% of its water from Northern California and the ability to treat local wastewater and then inject it back into the aquifer will give it significantly greater predictability over the price and the provenance of its future water sources.

Construction firm Shimmick is tipped to use UF and RO systems supplied by Wigen Water Technologies, incorporating RO membranes from Hydranautics. This marks a resounding home win for the membrane company, which has its US headquarters – and its US manufacturing facility – in Oceanside. Danaher subsidiary Trojan is expected to supply the UV system.

By injecting water directly into the aquifer through a series of injection wells, the City expects to see aquifer levels begin to recover within six months of the project becoming operational. A future 3MGD (11,355m³/d) expansion of the treatment capacity is likely to come online by 2030, but is expected to use percolation basins rather than injection wells. "The injection well component was a lot more cost-effective to implement first, and it gets the water into the ground right away," Dale told GWI.

Although Oceanside had considered building its own seawater desalination plant as a way of diversifying its water sources, this was ultimately felt to be too expensive (the city cites cost concerns as the reason it doesn't buy water directly from the Carlsbad desalination plant, despite its extremely close proximity).

"We've calculated that the Pure Water Oceanside costs are about $2,155/AF, compared to today's current imported water costs, which are around $1,700-1,800/AF all-in," Dale observed.

"What we've seen when we've implemented local projects is that over time, those projects become more cost-effective than imported water. So for instance our [brackish water] desal plant produces water at about $900-1,000/AF, which is well below what we're paying for imported water. We believe that over time, the Pure Water supplies will also show cost savings in comparison to imported water."

Once the second phase of the Pure Water Oceanside project comes online, the city's water resourcing pie will look a lot more diverse than it is today (*see chart, facing page*). A separate 3MGD (11,355m³/d) recycled water treatment plant which is nearing completion by CDM Smith will help conserve potable water supplies by reusing treated effluent to irrigate golf courses and athletics fields, while Oceanside expects to bid out a brine minimisation contract later this year to recover an additional 1MGD (3,785m³/d) of water at its Mission Basin Groundwater Purification Facility, which uses reverse osmosis to treat high-TDS water from the local aquifer.

Once the first phase of the Pure ▶

SIDE BY SIDE IN OCEANSIDE

By co-locating a future advanced water purification facility (pictured below) at the site of its existing San Luis Rey Water Reclamation Facility, the City of Oceanside will make considerable savings on infrastructure costs.

Source: City of Oceanside

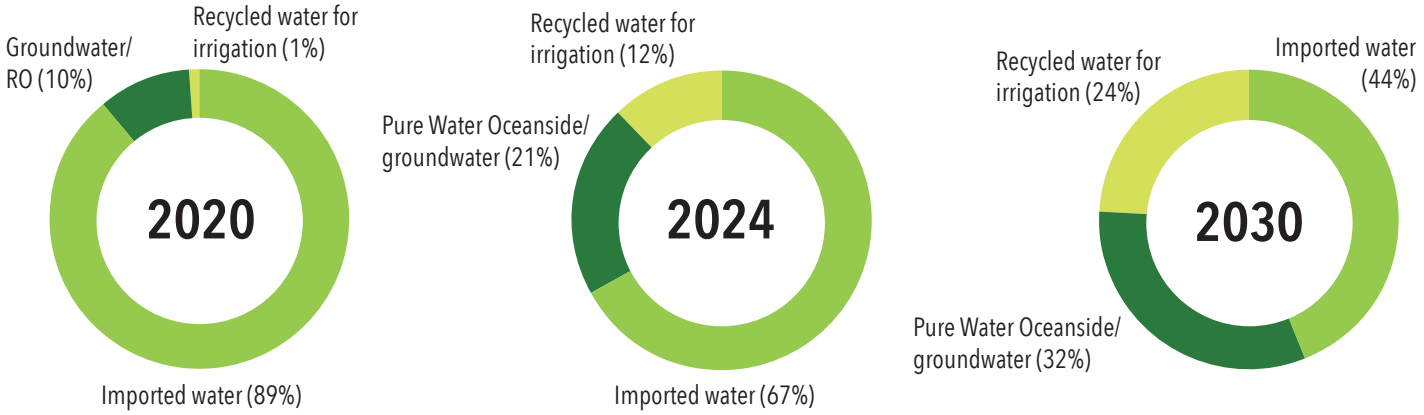
> "We believe that over time, the Pure Water supplies will show cost savings in comparison to imported water.
>
> Cari Dale, City of Oceanside

Water Oceanside project begins diluting the aquifer with reclaimed effluent, that bring with it the potential to generate some savings on energy costs at the BWRO plant, given that the TDS of the feedwater will inevitably go down.

Dale acknowledged that there is even potential to look at direct potable reuse for the project's second phase, although she stressed that no feasibility studies have been done in this regard, and that any DPR scheme would be subject to the State of California adopting appropriate water recycling criteria, which are not expected to emerge until at least 2023. ■

TOWARDS A MORE RESILIENT PORTFOLIO

The City of Oceanside has been proactive in its bid to diversify its water resources portfolio, embracing indirect potable reuse, brine minimisation, and recycled water for irrigation. Cost concerns mean it has avoided seawater desalination up until now, but this may become an option after 2030.



Source: City of Oceanside

US STORMWATER

EPA to review stormwater funding solutions

A new report assessing the availability of stormwater funding in the US will be presented to Congress with a mixed bag of recommendations. Change will still be required at the local level.

A new report finalised by an EPA task force this month outlines a range of recommendations to improve the availability of stormwater infrastructure funding in the US.

The report – which was mandated in the 2018 America's Water Infrastructure Act – identifies a stormwater funding gap of up to $10 billion per year. It recommends an array of possible strategies to address this shortfall, ranging from specific proposals such as the creation of a dedicated state revolving fund (SRF) loan programme for stormwater projects, to more general recommendations, including federal technical assistance for local communities.

Stormwater has long been underrepresented in federal and state funding programmes (historically just 4% of SRF funds have been used for stormwater projects), and unlike drinking water and wastewater programmes, it is not typically underpinned by a sustainable local revenue stream. Just 1,600 of the 7,550 public entities in the EPA's MS4 stormwater permit programme have dedicated revenue sources.

"Stormwater is still very much a local function, and if we can inform elected officials of the need to recognise stormwater as a true utility, that would go a long way towards accepting the need for fees and funding," explained EPA taskforce member and national director of stormwater and watershed management at Arcadis, Fernando Pasquel.

Some of the ideas contained in the report have been questioned by observers, however – particularly those that would be impractical to implement, such as grouping drinking water, wastewater and stormwater under a single 'One Water' SRF.

"It's hard enough to change one SRF programme – we've been talking about getting more stormwater projects in the clean water SRF for years – so the idea of merging programmes will just never happen," one industry participant observed to GWI.

Similarly, it is felt that other suggestions – such as streamlining federal grant application processes – will simply not generate the billions of dollars in funding required.

However, Joanne Throwe, co-chair of the EPA taskforce, defended the range of recommendations. "There is no one silver bullet here – we have to have a menu of different options available," she told GWI.

While the report acknowledges an increased awareness of innovative funding mechanisms for stormwater management, it does not include any specific recommendations to increase the uptake of P3s, environmental impact bonds, or credit trading markets.

The handful of stormwater P3s deployed in the US to date have not utilised private finance (*see GWI November 2019, p14*), and the report acknowledges that the "expected return for third party capital is mismatched with the risk profile of most stormwater projects".

The EPA will now prepare a response to the recommendations before submitting the final report to Congress in April 2020. ■

US WATER MIDSTREAM

Permian water midstream spending takes off

Increased demand for frac' fluids and the need to manage greater volumes of produced water are driving a strong uptick in spending on water management in the Permian Basin. Growth in produced water recycling is expected to coincide with disposal constraints.

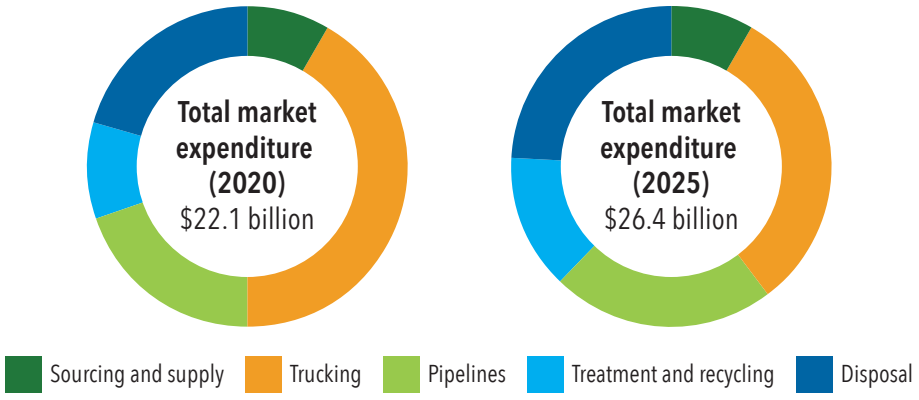
The unconventional Permian Basin of West Texas and southeastern New Mexico has become the most productive oilfield in the world, fuelling the development of a multi-billion-dollar water midstream sector centred around the efficient movement of water to and from well pads.

A surge in produced water volumes from 21.7 million bbl/d (barrels per day) in 2020 to 30.8 million bbl/d by 2025 will be accompanied by a jump in demand for source water, from 10.6 million bbl/d to 13.3 million bbl/d (*see chart, facing page*). While greater volumes of water will be required to support drilling and completions activity, produced water will need to be moved away from well pads quickly to avoid oil & gas production bottlenecks.

A new report published this month by Global Water Intelligence, *The Future of the Water Midstream*, considers the sector's trajectory in the coming years in the context of the unique characteristics of the Midland and Delaware sub-basins. Our data shows that overall expenditures for Permian Basin water management will grow from $22.1 billion in 2020 to $26.4 billion by 2025 (*see chart, above right*) as several trends shake out in the water sourcing and supply, transportation, disposal, treatment and recycling segments.

PERMIAN BASIN WATER MANAGEMENT EXPENDITURE

The speed at which spending on water management infrastructure rises in the Permian Basin will be shaped by state regulatory developments. Centralised recycling is projected to grow at the fastest rate.



Source: GWI

Reuse on the rise

One of the most significant trends predicted to unfold over the next five years is the rise of produced water recycling in the Permian Basin. In 2019, little more than 12% of the basin's produced water volumes were recycled rather than disposed, with only 20% of frac' water sourced from recycled volumes. The proportion of produced water that is recycled is projected to grow to more than 20% by 2025, while the percentage of frac' water needs that are met through recycled water is expected to grow to 47%.

Centralised recycling will grow at a faster rate than any other market segment, with a compound annual growth rate (CAGR) of nearly 42% projected between 2020 and 2025. As more large-scale recycling infrastructure is established, volumetric water treatment costs will inevitably come down. This will make produced water recycling a more economical and sustainable option, especially in the face of rising freshwater prices in the region. The factors driving this recycling boom include:

- **Disposal constraints:** Concerns over issues such as induced seismicity and formation overpressurisation have led to permitting delays and regulatory restrictions on the location and operation of new saltwater disposal wells (SWDs), especially in New Mexico's portion of the Permian Basin. As disposal becomes more of a challenge, the construction and service costs associated with new disposal assets will rise, precipitating a drop-off in SWD-related capital expenditure by 2023. These disposal constraints cast recycling as an attractive alternative to water displacement.

- **Pipeline networks are taking over:** One of the biggest expenses – and logistical challenges – for an oil & gas producer or a water services provider is the cost of moving massive volumes of frac' water and produced water. Transportation is shifting from trucking to high-capacity pipelines as water volumes grow and the demand for quick and inexpensive transport solutions intensifies. A significant pipeline build-out is already underway, with capital spending for that segment expected to peak in 2021 at $405 million. The development of interconnected, high-capacity pipelines has already seen the establishment of bidirectional water flows over longer distances, creating an environment conducive to centralised recycling operations.

- **Regulatory environment:** The movement towards greater recycling is not expected to unfold evenly across the Permian Basin. New Mexico's unique water challenges and the interests of regulators there will aid the uptake of significant centralised recycling in the Delaware Basin. In 2019, Texas and New Mexico both passed legislation related to produced water ownership and liability issues, removing some of the risk related ▶

> "Overall expenditures for Permian Basin water management will grow from $22.1 billion in 2020 to $26.4 billion by 2025.
>
> GWI's *The Future of the Water Midstream* report

to water transfers for activities such as recycling. New Mexico's legislation – spurred by the state's high water stress – also allows producers to void freshwater contracts if they choose to use recycled water for new well completions.

Across the Permian Basin, additional investment is needed to establish vast water networks comprising large-scale recycling facilities and pipeline infrastructure, as well as optimised disposal assets. A build-out of these kinds of systems will provide opportunities for a number of players, including water services and technology providers, as well as engineering, procurement & construction firms.

Investor interest is expanding

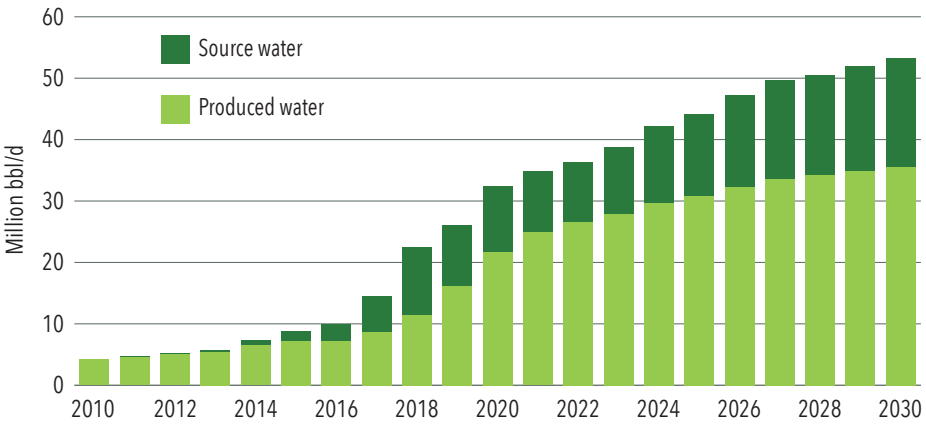
Facilitating the infrastructure build-out necessary to meet the Permian Basin's water challenges is the $9 billion-$11 billion of private capital that has so far been committed to water services providers such as WaterBridge Resources, H2O Midstream, and Goodnight Midstream. Additional investments are expected, as the water midstream sector offers the potential of high returns and insulated exposure to oil & gas market fluctuations through long-term service contracts.

While the public equity markets have been largely shut to water midstream firms over the last several years, private equity (PE) has been a prolific and very visible supporter of water midstream infrastructure. Some PE houses are backing multiple concurrent platforms in different oil & gas plays, while the market for secondary buyouts is resulting in some early exits for first movers. As the market becomes more mainstream, other sources of capital are becoming available to water services providers: in 2019, Singaporean sovereign wealth fund GIC purchased a stake in WaterBridge Resources, Canadian infrastructure fund InstarAGF acquired Oilfield Water Logistics, and Rattler Midstream – originally spun out from a producer – went public through a successful IPO. Deals like these are expected to become more prevalent as consolidation sweeps through the market.

The Future of the Water Midstream is available now. For details on how to order, see https://tinyurl.com/gwimidstream. ■

PERMIAN BASIN PRODUCED/SOURCE WATER VOLUMES

As source water and produced water volumes grow in parallel, the biggest challenge will be to close the loop by implementing economically viable recycling solutions.



Source: GWI

SELECTED PERMIAN BASIN WATER MANAGEMENT M&A DEALS (2019-2020)

The majority of recent water midstream asset acquisitions in the Permian Basin have been funded by private equity. The creation of economies of scale through buy-and-build strategies is already leading to secondary buyouts, although the success of future IPOs will depend on demonstrable shareholder returns.

Date	Acquiror	Target	Assets	Location
Jan 2020	Oilfield Water Logistics	EOG Resources	23 SWDs and 300 miles of produced water pipeline	Northern Delaware Basin
Dec 2019	Gravity	On Point Holdings	17 SWDs with more than 432,500 bbl/d, additional permitted disposal capacity and produced water pipelines	Midland Basin
Nov 2019	NGL Water Solutions	Hillstone Environmental	19 SWDs with 580,000 bbl/d of capacity, produced water pipelines with 680,000 bbl/d capacity, additional permitted capacity	Delaware Basin
Aug 2019	H2O Midstream	Sabalo Energy	9 SWDs, 4 Ellenburger SWD permits, and 37 miles of produced water pipeline	Northern Midland Basin
Jul 2019	Solaris Water Midstream	Concho Resources	13 SWDs and about 40 miles of pipeline	Northern Delaware Basin
Jul 2019	NGL Water Solutions	Mesquite SWD	35 SWDs with more than 1 million bbl/d capacity as well as water pipelines	Northern Delaware Basin
May 2019	WaterBridge Resources	PDC Energy	7 SWDs and 82 miles of pipeline	Delaware Basin
Apr 2019	XRI Holdings	Fountain Quail Water Treatment	Water treatment and recycling business	Permian Basin
Feb 2019	WaterBridge Resources	NGL Water Solutions	9 SWDs, additional SWD permits and 10 miles of pipeline	Delaware Basin

Source: GWI WaterData

CORPORATE STRATEGY

Baswood buy expands Cambrian's service offering for industrial water reuse

An expanded wastewater treatment portfolio and a broader customer base will provide new avenues for Cambrian Innovation to increase the uptake of its outsourced service model in the US food and beverage sector. It also brings international exposure.

Cambrian Innovation has acquired high-strength wastewater treatment specialist Baswood as part of a move to expand the reach of its outsourced industrial water reuse offering.

Cambrian provides distributed industrial wastewater treatment solutions – predominantly to food, wine and brewing companies in the US – that recover water and energy for reuse in industrial processes.

Since launching out of MIT in 2006, Cambrian has generated demonstrable traction in recent years – increasing its revenues by 50% year-on-year in 2018, and securing $18 million in equity and project finance capital via a fundraising round led by Spring Lake Capital in October 2019.

The acquisition of Baswood, a US firm backed by investors including Inherent Group and actor Edward Norton, doubles Cambrian's installed base, and provides immediate exposure to "big beverage" clients such as LVMH-Domaine Chandon, AB InBev, and Keurig Dr Pepper.

The move provides Cambrian with a complementary fixed-film biological treatment process (BioViper) that can be deployed alongside its existing enhanced anaerobic digestion product (EcoVolt) as a polishing step, or else as a pre-treatment phase ahead of an EcoVolt membrane bioreactor.

"What interested us about BioViper is that it's a really effective and reliable technology – which is what you need when you're dealing with industrial waste streams," Cambrian CEO Matthew Silver told GWI this month. "Yet it's also cutting-edge in that it involves low-opex, low-sludge production, and low energy requirements."

This low lifecycle cost is crucial to Silver's plans to deploy the Baswood portfolio as part of Cambrian's existing long-term service model, dubbed a 'water-energy purchase agreement' (WEPA). This outsourced arrangement involves Cambrian financing the upfront capital cost of a wastewater treatment system and then operating it, while providing the client with recycled water and energy.

"The fact that this is a technology with low lifecycle costs relative to the competition – albeit with slightly higher capital costs – makes it really attractive for us to wrap it into a WEPA," Silver explained.

WEPA sales currently account for less than half of Cambrian's revenues, although Silver expects that proportion to increase in the near term.

"I think we're starting to see more market acceptance of the approach, and right now, about half of our pipeline deals are WEPA instead of capex," Silver revealed. "WEPA shifts risk, reduces opex, and increases return on equity in a way that a capital project cannot offer – and for many customers, that is ideal."

To date, neither Cambrian nor Baswood has played outside of the food and beverage and private domestic markets (resorts and hotels), although Silver explained that there are clear treatment opportunities in other industrial wastewater sectors with high biological oxygen demand and high levels of suspended solids. ■

WATER FINANCE

Institutionalising investment in distributed infrastructure

Money is flowing into vehicles which finance smaller-scale water-as-a-service projects. The market is still wet behind the ears.

A dramatic uptick in the inflow of institutional capital into platforms which offer finance for distributed infrastructure – including water and wastewater – reflects a growing belief that with the right model, the approach can generate meaningful returns.

Generate Capital's announcement this month that it had secured more than $1 billion of funding for its sustainable infrastructure investment platform comes hot on the heels of December's $156.5 million fund raise for Spring Lane Capital. Other distributed infrastructure funding vehicles with an interest in water, such as Equilibrium Capital and Ultra Capital, have also attracted significant volumes of institutional capital.

"One of the reasons we were able to attract attention is because we provide access for large institutional investors to be able to invest in distributed infrastructure," explained Rob Day, general partner at Spring Lane Capital. "This is an area with huge growth potential, and by bringing in significant amounts of third-party capital, we can hopefully unlock a lot of that growth," he told GWI.

Platforms like Spring Lane and Generate Capital are increasingly providing funding on a pooled basis, the idea being to replicate the technology and the service package across multiple contracts. Standardisation reduces the risk both for the financier and the technology supplier, while increasing the client's confidence that it is buying a system with a proven operational track record.

"If you think about the analogy of rooftop solar finance, where third-party capital came in and enabled homeowners in the US to get solar on the rooftop for no money down, that unlocked tremendous growth in the market," said Day. "We're trying to help companies in the water sector to access mainstream capital by making the systems and the contracts as standardised as possible. Once we do that, there's ample evidence that big Wall Street banks with relatively cheaper capital are eager to put hundreds of millions to work doing the same thing. At this point, we've got over $6 billion of deal pipeline, so there's a lot of potential." ■

CALIFORNIA

Tackling PFAS in Orange County

The cost of well closures and treatment could amount to $850 million.

Orange County Water District has taken 40 drinking water wells contaminated with trace levels of PFAS offline in response to a more stringent recommendation issued by the state of California this month.

The affected wells represent about one fifth of the municipal drinking water wells in OCWD's service area, and the switch has caused the district to rely on costlier imported water – at an estimated annual cost of $30 million.

The decision follows the introduction of a new response level for PFOA and PFOS, (10ppt and 40ppt, respectively). While not a mandatory requirement, a state law which came into effect last month requires utilities to either treat or blend the affected water, or otherwise notify customers of their decision to forego this recommendation.

"All the utilities we work with do not want to be put in that position, and are choosing to immediately shut down those affected supplies," OCWD's Jason Dadakis told GWI.

With the wells offline, OCWD is pressing ahead with the design and construction of treatment systems for the affected service providers over the next several years, at an estimated capital cost of $200 million, with a projected operating cost of $462 million over 30 years. Together with the temporary increased cost of imported water, OCWD estimates a total cost of $850 million to address PFAS in the county.

OCWD is currently in the process of procuring on-call design services for the systems, and awarded a pilot PFAS treatment project to Jacobs last year.

While Orange County is somewhat unique in its concentration of industrial activity linked to PFAS contamination, the man-made chemicals are nevertheless appearing statewide, and it remains to be seen whether a mandatory state maximum contaminant level (MCL) – which is currently under development – is as stringent as the new response level. ■

QUARTERLY RESULTS

North American water equipment stocks finish 2019 on a high

The final quarter of the calendar year was a bumper period for most listed equipment and service providers. How long will the momentum continue?

North American water equipment and services stocks closed out 2019 with a strong set of quarterly results, marking a positive end to a year that had earlier been plagued by tepid industrial growth and trade tensions.

Evoqua delivered another consecutive set of robust quarterly results, putting the troubles and restructurings of 2018 firmly in the past. The company is leveraging its full suite of PFAS treatment products to respond to lucrative contract opportunities in the US (*see story, left*), and is continuing the roll out digital capabilities across its portfolio.

Tetra Tech posted record revenues and earnings this past quarter, including a 25% year-on-year increase in international revenues (particularly in the UK, where Tetra Tech acquired WYG for £43.4 million in July 2019). Mueller Water, too, had a positive fiscal first quarter, with higher than anticipated sales of valves, hydrants, and leak detection products causing the company to increase its guidance for the full year.

Pentair, meanwhile, is forecasting a return to top-line growth in 2020 – the early signs of which were already evident at the close of last year. The company announced last month that it would restructure into two new reporting segments as it prioritises its point-of-use treatment and residential products over legacy industrial valves and membrane technologies.

On the flip side, Xylem reported quarterly revenue and earnings that were effectively flat on the same period last year, and its shares underperformed after the company projected continuing short-cycle industrial headwinds into 2020.

"While we are not fans of back-end-weighted stories, we believe that Xylem made a compelling case for why 2020 organic growth should inflect from negative in 1H 2020 to positive mid-single digits in 2H 2020," RBC analyst Deane Dray commented in a note to investors this month.

With an unpredictable US general election on the horizon, and growing uncertainty around the impact of the coronavirus on international supply chains, the momentum many firms enjoyed at the close of 2019 may not carry far. ■

QUARTERLY WATER EQUIPMENT COMPANY RESULTS

Xylem's tough quarter notwithstanding, the crop of water equipment and services names tracked by GWI enjoyed positive momentum during the three months ending 31 December 2019.

Company	Quarterly revenue (%)		EBIT (%)	
Danaher	$4,868.4m (+5.7%)	▲	$961.7m (+11.4%)	▲
Ecolab	$3,823.6m (+1.7%)	▲	$560.4m (-3,7%)	▼
Advanced Drainage Systems, Inc.	$393m (+23.6%)	▲	$23.7m (+42.8%)	▲
Xylem Inc.	$1,371m (-1.1%)	▼	$195m (+0.5%)	▲
Rexnord	$491.7m (+1.4%)	▲	$77.6m (+9.5%)	▲
Pentair	$755.2m (+2.0%)	▲	$122.3m (+8.2%)	▲
H2O Innovation	Can$33.3m (+13.3%)	▲	-Can$1.2m (-)[1]	▼
Mueller Water Products	$212.6m (+10.3%)	▲	$20.3m (+27.7%)	▲
Evoqua	$346.1m (+7.1%)	▲	$69.7m (+)[2]	▲
Tetra Tech	$798m (+11.2%)	▲	$47.3m (+12.6%)	▲

1) Loss before income taxes increased from Can$1.1 million in the same period last year

2) EBIT increased from -$6.4 million in the same period last year

Source: Company data

WATER INVESTMENT

Brazilian utilities line up for uncertain IPOs

Private concessionaires may yet have the edge over state-owned utilities when it comes to investor appetite for IPOs.

Three state-owned sanitation companies in Brazil have already made moves towards filing for IPOs, as companies look to raise capital in preparation for ambitious investment requirements that could be passed into law this year.

Legislation moving through the Brazilian parliament would establish a deadline of 2033 for the introduction of universal water and sanitation services in the country (*see box, below right*). State-owned companies, which often belong to governments suffering serious financial issues, do not typically have the resources to meet these requirements.

The most advanced move has been made by the Companhia de Água e Esgoto do Ceará (Cagece), which aims to raise up to $350 million after registering for an IPO in December 2019 with the Securities and Exchange Commission of Brazil.

Owned by the state of Ceará and the City Hall of capital city Fortaleza, Cagece serves around 5.4 million clients in 152 of the 184 cities of Ceará. In 2018 it generated revenues of $320 million and a net profit of $18 million.

It is most likely to be followed by Companhia Pernambucana de Saneamento (Compesa), in the state of Pernambuco, and Companhia de Saneamento de Goiás (Saneago), which have already outlined plans to go public to the CVM, while the government of Rio Grande do Sul has also shown interest in following the same path later this year for Corsan.

The state government of Bahia has also hinted it will open the capital of Empresa Baiana de Águas e Saneamento (Embasa) after the approval of the new regulatory framework, with the aim of raising up to $1.2 billion through the sale of 49% of the company's voting capital. It has taken on Santander and the Bank of Brazil to advise on the process.

However, previous attempts by state-owned companies to tap the public equity market have not borne fruit, and sources in the Brazilian market warned GWI that convincing investors of the value of the assets could be a tough process.

Percy Soares Neto, executive director of the Brazilian Association of Private Utilities for Water and Sewage (Abcon-Sindcon), told GWI that while there is a positive general appetite for investment in water assets, state-owned companies are often seen as a poor bet, and he feared that they may struggle to attract buyers.

"We need to differentiate IPO operations carried out by state-owned companies from those carried out by private groups," he said. "IPOs at state-owned companies can be a very bad deal because the buyer has less legal security and he can't be confident if the tariffs will remunerate the business in the future."

Meanwhile, one fund manager, responsible for a portfolio worth around $4 billion, told GWI that the fund would only be interested in government-controlled equities at a discounted price.

"It's a high-risk business," GWI's source said. "If I made a deal like this, I would offer a much lower price than the company is really worth. The banks and consultancies that are telling the governments that this is a good deal are only interested in the fee for the operation."

Investors are perhaps more likely to consider equity investments in the privately owned companies that are in pole position to benefit from the new wave of water and wastewater PPPs and concessions that are coming to market in Brazil.

Major concessionaires like Iguá Saneamento, Aegea Saneamento and BRK Ambiental (formerly Odebrecht) have all hinted at possible initial public offerings in the near future. ■

BRAZILIAN REGULATION

Brazilian sanitation legislation race goes down to the wire

The move to open the market for investment has been two years in the making. If it is not approved soon, it risks being kicked into the long grass for another year.

Fears have been raised over the progress of a crucial piece of legislation passing through the Brazilian parliament that aims to rewrite the way the country's sanitation sector is run.

After being approved by the House of Representatives in mid-December, the Sanitation Projeto de Lei (known in the House by its number 3.261/2019) was recently sent to the Senate, where it will be evaluated by the Environment and Infrastructure Commissions, on dates yet to be defined. Later, the President of the Senate will define the date on which the bill will be voted in plenary.

However, political and congressional time is expected to be short in 2020, with municipal elections in October set to dominate proceedings in the latter part of the year. Some sources in the market are not optimistic. "If the Senate doesn't vote by May, the mayoral election campaigns will overrun the whole calendar," one source at an investment fund managing a portfolio including sanitation company shares told GWI.

An advisor to senator Tasso Jereissati, who will report on the Projeto to the Infrastructure Committee, told GWI he is confident the bill can get through in time. He said senators would be looking to push through the bill before leaving for their states' political campaigns, because the regulatory framework for sanitation had already been defined as one of the agenda priorities for the Senate this year.

The main objectives of the Projeto – which has been under discussion in various forms since 2018 – are to centralise the regulation of sanitation services at a federal level, and to institute the mandatory rebidding of so-called service contracts at the end of their lifespan.

State-owned sanitation companies must also guarantee the universalisation of service coverage by 2033, while hitting a raft of other targets including the elimination of service interruptions, improvements in treatment processes, and improvements in efficiency.

The process is likely to stimulate significant amounts of capital raising among Brazilian sanitation utilities. ■

COMMENT

Putting the polluter first when it comes to payment

Utilities themselves have little to gain from pushing for more water regulation. Instead, it is potential water polluters that should share the load of costs, says George Hawkins.

At the start of 2020, I realise that one current priority was highlighted by author Seth Siegel at last November's American Water Summit. He offered a call to arms to expand drinking water protections as further described in his provocative book *Troubled Water*.

Siegel begins with the story of Hoosick Falls, New York, an epicentre for the production of Teflon. I remember our first Teflon frying pans – marveling at how food just slid off the surface. This trait, the result of the combination of PFOA chemicals concocted by 3M and Dupont, is now ubiquitous. These chemicals are used in cookware, firefighting foam, popcorn bags, fire retardant clothes and countless other products.

While companies have generated enormous profits from these chemicals and consumers have benefited from the features, there is a dark side. Siegel describes the health consequences when PFOAs contaminate water supplies – embodied by an unusual hotspot of cancers and other illnesses in Hoosick Falls.

Siegel's message was that the process of protecting drinking water in the US is broken. He recounts the tortured history of regulatory starts and stops around PFOAs, a history paralleled in some respect by the story of lead in water in Flint, Michigan. Siegel seems to suggest that the problem is centred with government and water utilities. This, from the introduction: "But if this book has no villains, perhaps it is fair to say that there are many culprits and bystanders. These people include some elected officials, some heads of regulatory agencies, and some of those running water utilities."

Utilities and groups like the AWWA have long pushed for the scientific assessment of risk and cost benefit. This outcome is not a surprise – utilities understand that a new mandate will direct scarce funding to the new challenge, diverting money away from others. The request that a risk be clear and that the benefit will outweigh other improvements is a fair one.

Siegel is right that we need to reconsider how drinking water standards are developed, particularly with respect to a range of new contaminants. Yet there is an omission in Siegel's list of culprits. Utilities understand that imposing requirements will be translated into higher costs for ratepayers – the same people at risk from the chemicals. What about the companies that profited from these chemicals? Should not 3M, DuPont and the rest foot the bill?

This omission is related to the precautionary principle, followed more often in Europe, where new chemicals must be shown to be safe before they are used. Not so in the US, where new chemicals are used all the time, and typically need to be proven dangerous before they are regulated. The US gains the benefit of new chemical, but also accepts the risk if a chemical is determined to be dangerous after they are used.

I tend to favour the precautionary principle if a chemical is projected for widespread use, because it so much harder, and more expensive, to remove a chemical once it is already found in the water supply. If not, though, the polluter-pays principle should apply. Polluter pays ensures that the producer of a chemical pays for its clean-up. The clean-up costs must then be included in the price of the product. The principle is mostly used to govern Superfund and other hazardous waste sites. The costs can be high, which is why many companies demand proof before chemicals are defined as hazardous.

My suggestion is that companies that profit from the sale of a chemical that proves to be dangerous should pay for the cost of its clean-up and water treatment. Facing this risk, companies will be far more cautious about the use of chemicals in the first place, and the public will not be left footing the bill if they get it wrong.

Utilities are world class at solving problems if there is sufficient funding. Adding the polluter pays principle to additional protections will improve public health and hold companies responsible for the chemicals they sell – particularly if they end up in our drinking water! ■

AMERICAS IN BRIEF

- Family-owned infrastructure software developer **Bentley Systems** has confidentially filed for an initial public offering in the US. The company generates $700 million a year in revenues.

- **ESG Operations** has signed a 10-year contract to operate the wastewater infrastructure owned by the Eatonton-Putnam Water & Sewer Authority in Georgia.

- Brazilian water concessionaire **Aegea Saneamento** posted a 15.5% rise in Q3 EBITDA to BRL295 million, on revenues of BRL610.5 million ($140 million; up 14%).

- **Aegea** also completed a BRL305 million 5-year issue of debentures, while Brazilian water utility **Sanepar** is preparing to issue up to BRL350 million of 7- and/or 9-year debentures.

- Canadian UV-LED technology company **Acuva Technologies** has raised Can$5.4 million (US$4.1 million) of growth financing to expand its international sales efforts for drinking water treatment systems.

- Ian Robertson will step down from the CEO role at **Algonquin Power** later this year (to be replaced by power market veteran Arun Banskota), while CFO David Bronicheski also announced his departure this month.

- Fresh from a $235 million regulated acquisition spree in 2019 (involving a total of 21 systems), **American Water** started its 2020 campaign by closing on the acquisitions of Fruitridge Vista Water Company (CA) and the water system in the Town of Glasgow (WV).

- Private equity group **1440 Capital has** purchased a controlling stake in **Aclarus Ozone**, a Canadian supplier of advanced ozone-based treatment solutions for water and wastewater.

- **British Columbia Investment Management Corporation** has agreed to acquire a significant minority stake in point-of-use water solutions specialist **Waterlogic** from private equity player **Castik Capital** and company management. Waterlogic generates annual revenues of around $400 million. ■

PHILIPPINE CONCESSIONS

Billionaire Enrique Razon Jr. takes control of Manila Water

The port operations tycoon – and perceived presidential ally – has seized control as the concessionaire comes under sustained political pressure.

This month in Asia Pacific:

A tumultuous week at the start of February saw Filipino billionaire Enrique Razon Jr. make a move to take control of concessionaire Manila Water, securing majority voting privileges through a grant of proxy rights, on top of an agreement to buy a 25% stake.

The move could have political implications beyond the rise of a new player in the water sector. The investment by port operations tycoon Razon comes at a sensitive time for Manila Water, which, alongside fellow Metro Manila concessionaire Maynilad, is out of favour with president Rodrigo Duterte. A government review of the concession contracts, which Duterte claims contain unnecessary provisions, is ongoing.

In terms of the acquisition, Razon's company Prime Metroline Holdings will subscribe for 820 million new common shares at PHP13 per share for a total of PHP10.7 billion ($209.4 million), with the proceeds expected to shore up Manila Water's balance sheet and support its capital spending programme. The company also expects potential benefits from exposure to new markets through Razon's port operations, which stretch from Asia to Europe, the Middle East and Latin America.

Three days after the acquisition announcement on 3rd February, Ayala Corporation, the family conglomerate which remains the largest shareholder in Manila Water, announced that it would grant proxy rights for a certain number of preference shares to Trident Water, a company Razon is to incorporate. This will leave Razon with 51% of the voting rights and thus effective control of the company's future direction, assuming the subscription agreement closes as planned after Manila Water's annual stockholders' meeting in mid-April. Razon subsequently issued an obligatory tender offer for publicly held shares of Manila Water at PHP13 a share on 7th February. The company's share price closed 11.23% down on the day the tender announcement was made.

A business tycoon buying into the water business is not new in itself, as a significant part of the water industry in the Philippines is controlled by wealthy families and businessmen (*see table, below*). "Almost all of the conglomerates who have political influence and economic impact have gone into the utilities sector," a market observer in the Philippines told GWI, adding that going into the water utilities space is a logical step for Razon, who already has some investments in power services and water infrastructure construction.

Some observers believe that, aside from the possible business synergies, ▶

MANILA'S CLASH OF THE WATER TITANS

The large contract sizes and relatively stable returns on offer mean the water industry in the Philippines is familiar territory for some of the country's richest business tycoons. Who are the major players, and what is their involvement in the sector?

Who?	Water presence	Net worth
Manny Villar – former senator and property magnate, married to senator Cynthia Villar	Controls Prime Water, which has established a large number of smaller joint venture concessions across the Philippines	$6.6bn
Anthoni Salim - Indonesian businessman with interests in various industries; controls investment company First Pacific	Ultimately controls Maynilad as well as Metro Pacific Water, which is active outside of Metro Manila. Additionally controls Aetra Air, Jakarta's east zone concessionaire, through Moya, and is rumoured to also have bought Jakarta west zone concessionaire Palyja	$5.5bn
Enrique Razon Jr. – CEO of port operations giant ICTSI	Holding company Prime Metroline is developing the Wawa Dam project; has negotiated a 25% stake and majority voting rights in Manila Water	$5.1bn
Jaime Zobel de Ayala – leads conglomerate Ayala Corp, active in real estate, banking, telecommunications, water and other industries	Remains the main stakeholder in Manila Water, which has several projects outside Metro Manila as well as a presence elsewhere in Southeast Asia	$3.7bn
Lucio Tan – CEO of MacroAsia, with interests in tobacco, spirits, banking and airlines	MacroAsia is involved in the development and construction of water treatment facilities across the Philippines through its property development arm. Has plans to spin off water unit through an IPO	$3.6bn
Mercedes Gotianun – chairwoman of Filinvest, which has interests in real estate, sugar, banking and hospitality	Filinvest formed a joint venture with Singapore's Hitachi Aqua-Tech to develop its water business in 2019. It currently develops and manages water supply systems for its properties. Has also previously expressed interest in bidding for bulk water supply PPPs	$2.2bn
Consunji siblings – have control of property development company DMCI Holdings	DMCI, Maynilad's second biggest shareholder, is the family's holding company	$2bn
Erramon Aboitiz – recently retired CEO of Aboitiz Equity Ventures, active in a variety of industries	Active through bulk water supply project Apo Agua and bulk water service provider Lima Water Corp; has a minority stake in Balibago Waterworks	$165m

Source: GWI, Forbes

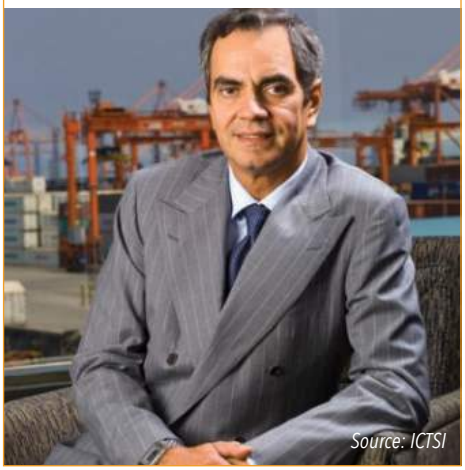
Manila Water might also have been keen to get Razon on board as he is perceived to be an ally of the president. Selling parts of the business to someone on the right side of the fence has emerged as a way to deal with pressure from Duterte. "Other family businesses under attack have done the same thing," observed our source.

It has not been confirmed when negotiations for the deal started, but indications are that it was a sudden decision triggered by the attacks on the company and the Ayalas – including threats of criminal prosecution – by the president. "There were no indications at any point that the Ayala family wanted to lose control of one of their core businesses," GWI's source said.

However, it is understood that the government review will continue despite recent events. Manila Water told GWI that according to the government – which has enlisted the Asian Development Bank to study the economic and financial implications – it may take three to six months before a new agreement can be finalised.

ENRIQUE RAZON, JR.

The port services magnate now has effective control of water concessionaire Manila Water.



Source: ICTSI

In the meantime, it remains to be seen whether Maynilad pursues a similar strategy. The majority stake is ultimately controlled by Indonesian Anthoni Salim, although its Filipino chairman Manuel Pangilinan faced criticism alongside the Ayala family. Filipino company DMCI Holdings, controlled by the Consunji family, holds a minority stake.

Razon's Prime Metroline is developing the Wawa Dam bulk water supply project which will supply Metro Manila, gaining approval from regulator Metropolitan Waterworks and Sewerage Systems (MWSS) last year. It also signed a 30-year offtake agreement with Manila Water for the project in August 2019. The project will supply 80,000m³/d by the end of 2021, and an additional 438,000m³/d by the end of 2025. The company was also in the running to bid for another big water supply project, the Kaliwa Dam, before it was switched from a PPP project to one dependent on Chinese funding.

Prime Metroline Holdings and Manila Water both declined to comment on the deal for the purposes of this article. ■

CHINESE WATER ASSETS

Beijing Capital targets industrial water market with new buys as Macquarie looks to exit China

The acquisition of Macquarie's industrial wastewater asset in Dalian has highlighted the ambitious entry of China's leading municipal water infrastructure developer into the industrial space. It also means Macquarie's exit from China is finally underway.

Australian investment group Macquarie began a long-planned pullout from some of its Chinese water investments this month with a high-profile sale to Beijing Capital.

On 14 February, the Shanghai-listed state-owned developer announced the acquisition of 100% of Dalian Hengji Xinrun Water Company (Hengji Water) for RMB1.253 billion ($179 million). It is the first of several Chinese water assets Macquarie has been looking to sell.

Hengji Water owns and operates two industrial WWTPs and one municipal water reclamation facility in Dalian with a combined capacity of 220,000m³/d. Macquarie bought a 48% stake in the company in 2014 through its investment arm in China, MEGCIF Asset Holdings III Limited, while the two original investors control the remaining 52%.

With stable revenues and a healthy net profit hovering around RMB140 million ($20 million) and RMB70 million ($10 million) respectively since 2016, Hengji Water also attracted significant attention from other potential buyers, including project developers such as Beijing Enterprises Water Group, Guangdong Water, and China Everbright Water, as well as financial institutions like Pingan Asset Management.

"We have been tracking the sale of this target for about two years," Bin Yang, general manager of Beijing Capital, told GWI. "It is a very valuable asset with stable cash flow and excellent business management, which benefits greatly from the synergy of both Macquarie's international managerial experience and the private shareholders' local operational expertise of water assets."

Macquarie is understood to have been eyeing an exit from China since last year. Besides Hengji Water, Macquarie's water assets in Shenyang are also expected to be put up for sale. "The water portfolio of Macquarie in China is gradually stepping into a mature period to be put on sale. The competition among the potential buyers is intense," Yang said.

In addition to its solid financial status, the deep industrial wastewater treatment know-how of Hengji Water was another factor that attracted Beijing Capital.

As the owner of up to 290 water and wastewater treatment infrastructure assets totaling over 28 million m³/d in capacity, Beijing Capital has a strong municipal water portfolio. Despite this, it only entered the dedicated industrial water space in January this year, when it secured a RMB508 million ($73 million) steel industry wastewater treatment BOT project for HBIS Group.

"We have our own industrial wastewater treatment ability, as about 10% of the feedwater for our municipal wastewater treatment plants is industrial effluent, although this ability is still limited," Yang conceded to GWI. "We believe the acquisition of Hengji Water will not only bring us the professional operational capabilities of industrial WWTPs, but its training institution specialised in industrial wastewater treatment can further enable us to cultivate more technical staff," he concluded. ■

DESALINATION

New South Wales considers its options for desalination as floods replace drought

The Australian desalination plants built as insurance in the wake of the Millennium Drought were controversial at the time, but gained support as they were switched on over the course of 2019. New South Wales is now considering its options for a new generation of desal.

Utilities in the Australian state of New South Wales are coming to terms with their options for water desalination infrastructure after recent heavy rains started to reverse low dam levels that had kicked off more interest in desal at the end of 2019.

In the state capital Sydney, the New South Wales government has engaged state pricing regulator IPART to carry out a capital cost review into a project aimed at doubling the capacity of the city's 250,000m³/d Kurnell desalination plant. After soliciting submissions from interested parties, IPART is set to release an issues paper in March, following which it will look for further submissions.

"The issues paper will provide people with a better idea of our thinking," IPART spokeswoman Julie Sheather told GWI. "What we're doing currently is scoping out what we feel the main issues are, as well as the timeline, so the review's still in its early stages.

"We will give guidance on what we think the key issues are, and once that comes out we have usually a period of about four weeks for people to make submissions. Then we move to the draft reporting stage, and at some point in the process there will be a public hearing."

The review by IPART, which describes the expansion of Kurnell as "a key element in protecting Sydney's water security" in its terms of reference, will dictate the ability of utility Sydney Water to raise prices in order to meet the tariffs that will be charged by plant owner Sydney Desalination Plant to cover the cost of the proposed expansion.

The Kurnell plant was one of a string of major plants developed around Australia as a response to the Millennium Drought that savaged the country in the early 2000s. In some cases these were built as insurance projects that would only be turned on when natural water sources ran short (a move that attracted criticism at the time from opposition politicians who said the idle plants represented a waste of money). But over the last few months, as the country grappled with the worst drought since the Millennium, all the idle plants were brought online – and utilities began to consider expanding the projects.

The Sydney expansion project is the most advanced of the major new desalination projects being considered, and is likely to offer a pointer to the future of the industry in Australia.

Meanwhile, further north in New South Wales, Hunter Water – which supplies water to 500,000 people in the Lower Hunter region – is implementing a broad range of measures as part of its response to the drought.

These include the staged introduction of water restrictions and a range of water conservation measures, as well as operational measures such as regional transfers with the Central Coast. It is also seeking planning approval for an 'off-the-shelf' drought response desalination plant at Belmont, on the outskirts of Newcastle. An environmental impact study carried out by GHD last year is currently with the NSW Department of Planning for review, but the recent droughts prompted Hunter Water to consider upsizing the project. It is also in the early stages of exploring a site for another desalination plant, at Walsh Point in the Port of Newcastle.

"The [Belmont] desalination plant is intended as an insurance policy and will only be constructed should our water storages reach critical levels," a spokesman for Hunter Water told GWI. "Hunter Water is preparing designs and seeking environmental approvals now so that the region is well placed in the unlikely event that storages reach critical levels."

Despite the extremely heavy rain that caused widespread flooding over the last month in the Hunter, dam levels in the region are currently still hovering at around 60%. Dropping below 65% was the trigger for Hunter Water to start actively developing the Belmont project.

The Hunter desalination projects are part of an overall review of the region's Lower Hunter Water Plan. Aside from desalination, dam-building, water conservation and leakage reduction, the plan recommends the indirect potable reuse of treated wastewater, an option Hunter Water said is still on the table. although it has not been done before in the region.

"We're keen to start the conversation with our communities, so over the coming months we'll be looking to carry out specific consultation activities to help us better understand community perceptions," the spokesman added. ■

HUNTING HIGH AND LOW FOR WATER SOURCES

The Hunter Valley and its vineyards are a popular tourist destination. But following long droughts and fires over the turn of the year it is now considering investing in desalination – even as heavy rains caused floods.

Source: Shutterstock

INDONESIAN WASTEWATER

Tenders released for new Indonesian WWTPs

The Asian Development Bank-backed projects aim to break through the country's procurement torpor, and drive new technology uptake

A group of development agency-financed centralised wastewater treatment projects are moving to the tender stage in Indonesia. While they could set an example for future wastewater projects, the true test may come after they are built.

The first international tenders for two wastewater treatment plants (WWTPs) in the provincial cities of Makassar and Pekanbaru were released by the Asian Development Bank (ADB) in late January, with a third tender for a WWTP in Jambi expected to follow soon. A total of $96.8 million will be spent on the three WWTPs and connecting sewerage systems under the Metropolitan Sanitation Management Investment Project, jointly funded by the ADB and the Australian government.

"We've had international interest – more than expected, as these are small plants," a source close to the process told GWI, adding that some of the interested companies are familiar names to the international water community. The capacities for the Makassar and Pekanbaru plants are 16,000m³/d and 8,000m³/d, respectively.

Indonesia has low levels of wastewater treatment coverage, and many of the existing plants use rudimentary technologies. However, achieving compliance with discharge standards for municipal wastewater – which were updated in 2016 – could require a technology shift.

Partly because initial design for the three projects was done prior to the discharge standards revision, a decision was made to use design-build for the projects, a procurement model rarely used in the country's wastewater treatment market, where few centralised projects have been built, and civil works-only contracting is more common. The Makassar plant will use moving bed biofilm reactor (MBBR) technology, while the other two plants will rely on conventional activated sludge.

Procurement for a fourth WWTP is underway in Palembang, jointly funded by the Australian and Indonesian governments. It will not be procured on a design-build basis, but has instead included a trickling filter in detailed design to meet the revised standards.

Questions remain, however, as to whether the projects will live up to expectations. The plants are designed for a certain capacity, but remaining issues with getting people to connect to a sewerage network and pay for services means it is unclear how long it might take before they will actually operate at full capacity, according to one source.

Whether the design-build model will see an upswing as a result remains to be seen. The Jakarta Water Department has indicated that some WWTPs planned for Jakarta (which has outlined a wastewater master plan) may be procured as design-builds, but these projects remain at the conceptual stage. Two other Jakarta WWTPs, funded by Japanese agency JICA, are likely to reach the tender stage first.

"The positive aspect is that finally there is money coming in for sewage treatment, and development agencies are coming in with that," one source concluded. ■

INFRASTRUCTURE MANAGEMENT

Sydney appoints A$9bn water team

The team of contractors will drive water infrastructure development for years to come.

As Australia's largest city comes to terms with the impact of extreme weather events on its water plans, local utility Sydney Water has started work on one of the country's largest ever water infrastructure programmes.

Sydney Water has started the A$9 billion (US$6 billion) Partnering for Success programme after awarding three 10-year regional agreements to consortia in December, covering design, civil, mechanical and electrical capital works, alongside technical works for all outsourced facilities maintenance activities. The three contracts, each worth A$3 billion (US$2 billion), cover Sydney Water's three operational areas.

The three regional delivery consortia (RDC) appointed were: John Holland, Comdain Infrastructure and WSP (south region); Broadspectrum, Downer EDI and Jacobs (north region); and Fulton Hogan and Abergeldie, Programmed, Stantec and Atlas (west region).

Over the new year period, New South Wales was hit hard by bushfires fanned by ongoing drought conditions and extreme temperatures. Shortly after the fires abated, the region was hit by heavy rainfall, which topped up dwindling dam levels but also brought its own problems with heavy flooding.

Mark Simister, head of delivery management at Sydney Water, told GWI that the start of the new programme had come at a crucial time for the city's water supply.

"Bringing all this expertise on board has come at an opportune time for Sydney Water, with the region having experienced widespread flooding in recent weeks after a prolonged and severe drought," he said. "While the recent rains in the Sydney catchment area have seen dramatic increases in dam storage levels, it's too soon to say if the rain is the start of drought recovery, or welcome temporary relief from drought conditions."

The value of the contracts are split roughly 70:30 between capital and operational responsibilities for the consortia. For the first time, Sydney Water based the outsourcing contracts on the New Engineering Contract 4 (NEC4) structure, which stresses performance-related targets and close collaboration between client and contractor.

"[In 2017] it was recognised that a 'once in a generation' opportunity was in place to make a significant difference to how Sydney Water does business in terms of operational project planning and delivery, as well as plant and facilities maintenance," Simister said.

"The new partnerships are engineered to benefit both Sydney Water and our RDC partners – and ultimately our millions of customers – by incentivising high performance, increasing productivity, and offering certainty of supply. Sydney Water's customers can expect to benefit greatly, as these arrangements deliver our multi-billion-dollar capital programme and some maintenance services." ■

DOMESTIC WATER TREATMENT

Indian regulations look to curb use of reverse osmosis for point-of-use water treatment

A proposed draft regulation from the country's environment ministry would limit the use of membrane-based water systems in an attempt to reduce reject water losses. In its current form, it looks unlikely to attract support from the market.

Under pressure from India's environmental watchdog, the environment ministry has issued a proposal to regulate the use of membrane-based water purification systems in the home. It could shake up a flourishing market, but might prove difficult to implement.

The draft notification issued by the Ministry of Environment, Forests and Climate Change (MoEFCC) is planned to become an amendment to the Environment (Protection) Act, and is a move towards reducing water wastage caused by low-recovery water treatment systems. The notification proposes to regulate membrane-based systems for residential, commercial and industrial uses, through banning reverse osmosis (RO) systems for domestic use in places where drinking water meets Bureau of Indian Standards norms, and setting recovery compliance targets elsewhere.

The move is likely to cause a huge concern for water treatment appliance and systems manufacturers in the fast-growing membrane-based drinking water market in India. Membrane-based point-of-use systems in India have proliferated in the last decade, owing to low confidence in water supplied by utilities. Bottled water consumption with filtration by RO systems has also grown at a steady pace, with many international and domestic brands in the market.

Although RO systems are being banned at the domestic level, it is unlikely that consumers will completely opt out of filtration systems for households. Apprehensions still exist about water quality due to problems such as pipe leakage, even in cities where the supply quality standards meet the norms. Furthermore, industry participants believe that the order is confusing, and will be very challenging to implement in practice.

Key concerns cited by industry sources include a lack of clarity on the roles and responsibilities of membrane manufacturers, distributors, and systems integrators, and the need for approval from State Pollution Control Boards on system water recoveries.

A senior water industry leader and membrane systems expert expressed serious concerns to GWI on the practicality of this proposed regulation, the traceability of membranes sold, and technical limitations with respect to targeted recovery rates. It is expected that industry participants will voice their concerns prior to the notification being finalised in around a month's time, and there may be some scope for changes, depending on the extent of the objections raised.

While the point-of-use market was earlier dominated by ultraviolet-based purifiers, a move towards using tankered water and groundwater by residential and commercial consumers shifted the market strongly towards RO membrane-based purification systems. Domestic companies, international appliance manufacturers and numerous small-scale manufacturers have all become involved in the market.

A lack of awareness has, however, resulted in consumers viewing RO systems as a solution for all water quality issues. As RO systems became the arbitrary choice for drinking water, it spurred concerns around mineral depletion for potable use, and high levels of reject water losses.

The current MoEFCC notification follows on as a compliance requirement from the May 2019 judgement of the National Green Tribunal, which stated that domestic RO systems with low recoveries of 20-25% were causing needless water losses and that membrane-based systems were not required in most places. While the judgement initially started as a case only for residential use, it has since expanded to cover the commercial and industrial segments. Membrane manufacturers will also have responsibility for the collection and safe disposal of used membranes. ■

IS POINT-OF-USE WATER TREATMENT ON THE ROAD TO RECOVERY IN INDIA?

India's new draft regulation aims to regulate membrane-based water purification systems at the point of use, spurred on by concerns of low-recovery systems wasting water. Market participants complain that it is confusing and overbearing.

Inlet water quality	Inlet TDS range (mg/l)	Specifications required	Recovery efficiency
Domestic category			
IS:10500 2012 compliant for TDS	<500	● RO use prohibited ● Ultrafiltration with disinfection system can be used	
IS:10500 2012 non-compliant	>500	● Membrane-based RO water purification system allowed	● >60% by June 2021 ● >75% by June 2022
Industrial/commercial category			
Irrespective of inlet water quality		● Combination of water purification including microfiltration ● Reject water collection and management	● >80% by June 2021 (commercial) ● >85% by June 2022 (industrial) ● >90% by June 2022 (both)

Source: MoEFCC

PUBLIC WATER FINANCE

India's budget lags on drinking water funds

As it announces huge new levels of drinking water infrastructure spending, India's government has shied away from allocating funding.

India's Union Budget, announced at the start of February, stopped short of backing the first-year plan of the ambitious $50 billion drinking water programme aimed at 100% tap connectivity, the Jal Jeevan Mission (JJM).

Although the central government said it would provide 58% of the total funds required throughout the course of the JJM programme, the 1st February budget allocated just INR115 billion ($1.6 billion) to JJM for the first year of its five-year mission plan. This was a surprisingly small amount compared to the overall first-year programme requirement of INR208 billion ($2.9 billion) mentioned in the JJM guidelines released in January 2020.

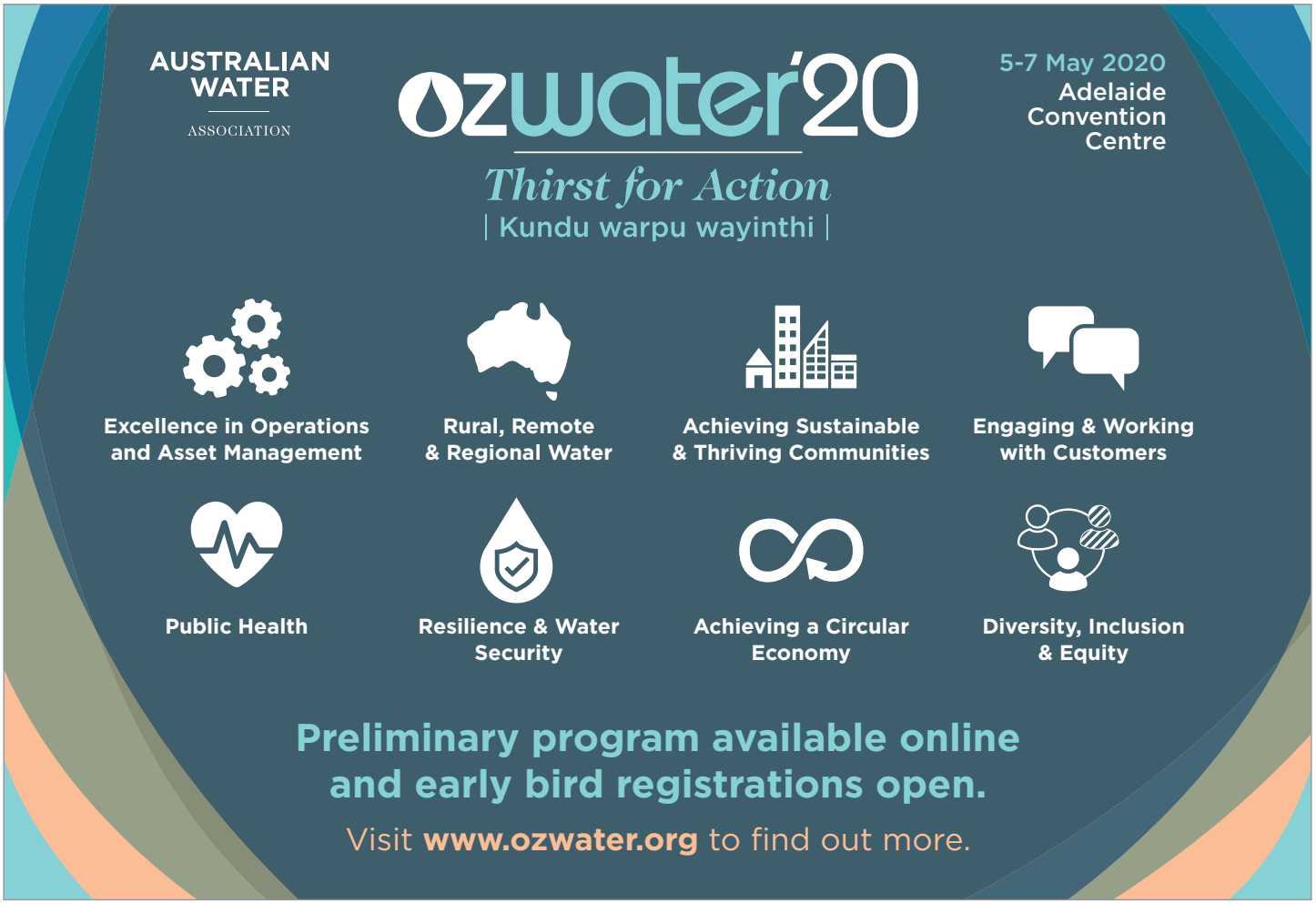
The allocated JJM funding amounted to just 3% of the portion of the budget for 'centrally sponsored schemes' – comparing poorly with programmes like the similarly ambitious Swachh Bharat Mission for universal sanitation coverage, which received 15% of the pot in the first budget after it was launched in 2014. The only silver lining for the JJM was that its allocation has increased by 15% from the previous year's provision for the National Rural Drinking Water Programme (NRDWP), which is planned to be subsumed into the JJM.

Elsewhere in the budget, the allocation for the National Ganga Plan, which covers sewage treatment under the Namami Gange river conservation programme, has increased by 14% to $114 million this year, although the programme has utilised only 29% of the total $4 billion allocated to it since 2015. The AMRUT and Smart Cities mission urban water schemes were meanwhile allocated an amount of $1.9 billion, unchanged from the allocation of the previous year. Five new Smart Cities will be selected this year, and the completion of AMRUT has been pushed back from March 2020 to March 2022.

The government is still claiming it will spend heavily on infrastructure programmes to boost the country's economic growth, which has slowed to 5.5% annually from 7% the year before.

Prior to the release of the Union Budget, the government unveiled its new 'National Infrastructure Pipeline', developed by the Ministry of Finance as part of this push. The National Infrastructure Pipeline covers potential infrastructure projects and tentative spending up until 2025, and includes the water and sanitation sectors.

$50 billion has been indicated as the spend for rural projects, while $230 billion has been specified for urban projects, which could fall under the Jal Jeevan Mission, Smart Cities, and AMRUT. However, all these projects are expected to happen within the existing national budget. ■



ASIA PACIFIC IN BRIEF

- Embattled project developer **Hyflux**, which is continuing to negotiate a rescue investment from the UAE's **Utico**, has received a letter from a new prospective investor, Singapore-based **Longview International Holdings**, in a joint venture with an unnamed Chinese entity. Details of the prospective investment had not been made public by the time GWI went to press.

- Singaporean entity **Aqua Munda**, meanwhile, extended the deadline for its separate offer to buy Hyflux debt to 22 February.

- SGX-listed **Sembcorp** has agreed to divest 100% of its water business interests in Chile to Spanish engineering group **Sacyr** for S$49 million as part of its strategy to divest peripheral assets.

- Indian water treatment company **VA Tech Wabag** released its Q3 financial results, which showed that although revenues rose from the previous quarter, the top line figures for the first nine months are still 15.7% lower than for 2018-2019. It also recorded several contract wins, including an ADB-funded water supply system project in Bhagalpur and an advanced water treatment plant in Switzerland.

- Australian water treatment chemicals provider **Ixom** has acquired US source water management provider **Medora Environmental**.

- ASX-listed water treatment specialist **Phoslock** has received a contract from Brazilian utility **Cedae** to treat the water in one of the main reservoirs supplying Rio de Janeiro, while announcing the resumption of work in China. Phoslock shares closed up 10.8% on the announcement.

- Filipino concessionaire **Maynilad** announced that it will spend PHP10 billion ($197 million) on a new 150,000m³/d water treatment plant drawing water from Laguna Lake.

- Ballast water treatment systems manufacturer **Panasia** has had its type approval for a number of its filtration and UV systems cancelled by South Korea's Ministry of Oceans and Fisheries. ■

COMMENT

Water needs to match digital thinking on 'last mile' needs

The internet has created an entrepreneurial and investment mindset focused on the link with customers. Water in Asia could benefit from a similar approach says Willy Yeo.

It has been a long time coming, but one could argue that there are increasing parallels one can see between water and e-commerce. Metaphorically, both are about the flow of a good that for admittedly different reasons tends to be extremely price sensitive – although ironically, one is clearly a necessity for life and the other largely pertains to its frivolities (I will leave it to our readers to decide which is which). But the more interesting parallel in my view lies in the fact that they both have relative inefficiencies in their last-mile distributions. To that end, e-commerce has been a lot more advanced in attracting the attention of startups to address this issue, having made sufficient noise in the past few years about both the pain points last-mile distribution inefficiencies create for both retailers and logistics service providers, and also the opportunities big data and smart capital can present in addressing these issues. I have long lamented the relative lack of love that water tends to get from the likes of private equity and venture capital firms, but as much as the production of clean water – especially in Asia – tends to focus on the large scale projects involving eye-watering sums of capital investments, distribution is often an overlooked sore point where substantial leakages and pilferage take place, all to the detriment of utility providers, investors and consumers alike.

But herein lies so much potential in big data and sensor analytics as well, if only the main paymaster – utility companies which in Asia tend to be government-owned – would be willing to provide a return to the money masters of the world. From a political perspective, funding such projects doesn't earn votes. They don't usually gather as much attention from the electorate, and partnerships with start-ups (or even established technology providers) can be political trouble if the process is deemed not transparent, even though this can sometimes stem from the sure newness of such technology, making the understanding of what is being invested in murky by itself.

To be sure, this may well improve if (or when) there is more widespread acceptance in the developed water markets where there is an established money market but water distribution infrastructure may be too vast or outdated to take on. Examples that come to mind include the US, Canada and Australia-New Zealand, which have seen more funds backing last-mile distribution initiatives from a technology standpoint. But Asia (even China) is a long way from that, which means that even if more money is pumped into the building of large water plants (itself an optimistic picture in some countries), more water only ends up being wasted or stolen, further reducing the overall returns of such investments, discouraging more investors and lenders from backing such endeavours, sparking an unfortunate vicious cycle of non-funding and non-supply.

As such, it may be worthwhile for the large infrastructure funding bodies like the Asian Development Bank and World Bank to expand their loan capacities to fund not just plant-building projects per se, but technology that deals with analytics and last-mile distribution networks. Naturally, this makes their work more complex because this opens up a vast number of possibilities of offerings and hence calls for the need for expertise in many new areas to evaluate where these technologies sit in the overall value chain and how to optimise each one in every unique project or locale. It is possible that this inherent dearth of economy of scale discourages such efforts, but to ignore both this need and the potential this can bring would be folly, because it only exacerbates the water scarcity issue in Asia and allows the problem of water wastage to fester. At the same time, the underlying platforms for such solutions to work have already matured to a substantial degree, having been tried and tested in arguably more onerous or complex scenarios like in fintech and e-commerce. It's time for a rethink of the last mile in water. ■

CTO

This month in Chief Technology Officer:

MARKET MAP

MBBR applications diversify as biofilm carriers go beyond space-saving niche

Pressures of plant capacity constraints and regulatory changes mean more firms want a slice of the biological carrier treatment market. GWI looks at the growth strategies pursued by established providers in the face of a commoditisation challenge.

Biological carrier-based treatment systems are enjoying a renaissance as regulations tighten and urban population growth puts pressures on treatment capacity and footprint. Moving bed biofilm reactors (MBBR) and integrated fixed-film activated sludge (IFAS) are strong candidates for intensifying wastewater treatment, but are also increasingly finding applications in biological nutrient removal and treatment of pharmaceutical residues. MBBRs especially are also primed for strong uptake in decentralised applications.

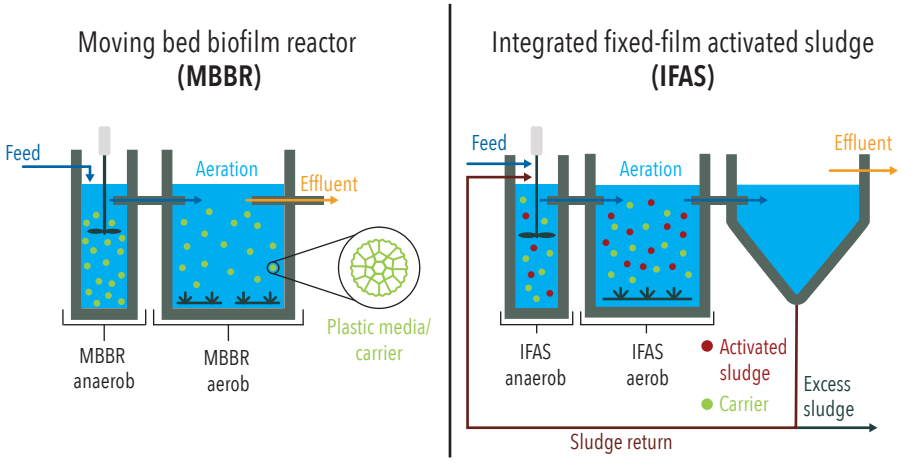
These technologies are chararacterised by the growth of a biofilm on free-flowing plastic media, also known as carriers, instead of the traditional biomass in suspension that is associated with activated sludge. This increases the surface area available for bacteria to break down contaminants in the water.

It is a sizeable market: GWI WaterData forecasts that MBBR and IFAS systems will make up around 20% of overall spending on aerobic biological treatment between 2020 and 2024. But while these carrier-based systems are in demand, there are stiff challenges. There has been widespread commoditisation of biofilm carriers, where they are just sold online as a mass-produced product. In response, technology providers are pursuing different strategies to stay ahead of the game, including pushing into new markets and emphasising their system configuration expertise.

The opportunities are there for those that prevail. As a straight-through process with no sludge recycle line, MBBR is well suited to packaged treatment options for countries with few sewer connections, including India and the Middle East. Meanwhile, a number of technology providers are proving MBBR to be successful against a list of drugs present in water streams. Using these carrier-based technologies in anaerobic conditions is also proving to have some stability advantages over more traditional anaerobic treatment systems in industrial wastewater.

DIFFERENT CONFIGURATIONS

Plastic carrier technologies can be configured in two different forms. MBBR is often, but not always, installed as a new build project. IFAS is more likely to be retrofitted to existing activated sludge plants.



Source: Filtration + Separation

The benefits of carriers

The main free-flowing carrier-based biological technologies are MBBR and IFAS. Moving bed biofilm reactors are a modification of fixed-film treatment that expands the available surface area for bacteria to break down organic matter and nutrients. A biofilm grows on mobile plastic carriers with a large surface area, meaning more treatment can be conducted in the same reactor volume. While MBBR has only biofilm carriers in the tank, IFAS contains attached biomass and suspended flocs similar to those in conventional activated sludge *(see figure, left)*. Providers are able to manipulate the biofilm on the media by changing the size, shape and material of the carriers.

Having emerged over thirty years ago, carrier technologies were originally hailed to be ahead of their time. However, with tightening nutrient discharge limits and constrained footprints today becoming all too familiar for utilities, the technology has now established itself within the market. Although membrane bioreactors (MBRs) also offer the benefit of a smaller footprint and better effluent quality, MBBR/IFAS is widely cited to be easier to operate and maintain. "Utilities realised that they ▶

didn't need such clean effluent if they were discharging to the sea or using it for land irrigation, so people have moved away from membranes," suggested Afnan Din, vice president for MENA at Headworks International, a key player in the carrier technology market.

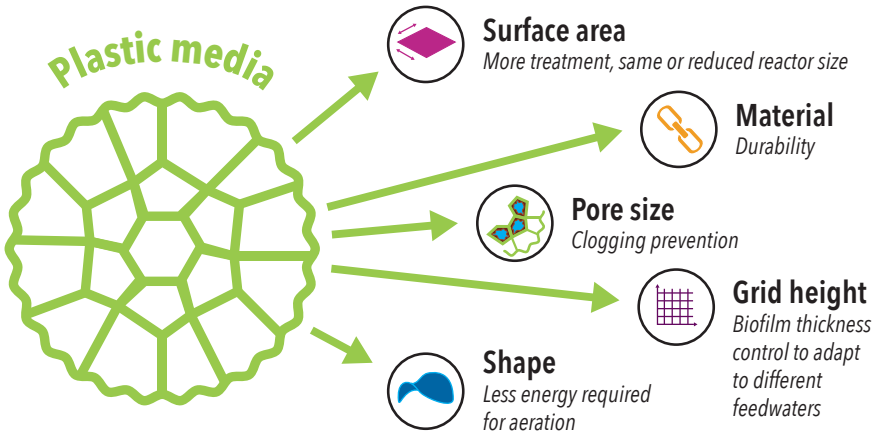
Another competing technology has emerged over the last decade. Aerobic granular sludge has shaken things up in the biological treatment market, promising the same advantages as carrier technologies, without the use of plastic. However, some providers contend that MBBR/IFAS processes still carry more surface area than aerobic granules, and conservative end-users are often looking for more established and proven technologies. For now, aerobic granular sludge is not regarded as a threat.

Staying in the race

For MBBR providers *(see table, facing page)* the real threat is closer to home; they are having to contend with commoditisation; a myriad of distributors are simply selling media en masse over the internet for utilities to buy and add to their existing activated sludge systems. This is a thriving market in countries where cost is the main driver of sales, such as India and southeast Asia. However, increasing numbers of these plants are experiencing issues post-installation due to a lack of expertise, such as clogging or degradation of the media. ▶

MEDIA AS A GROWTH STRATEGY

Technology providers manipulate a range of features on their plastic media offering, to provide for a wider range of wastewater characteristics. Firms like Veolia may choose to offer many types of media with varying features, while others focus efforts on finding an ideal media for many applications.



Source: GWI

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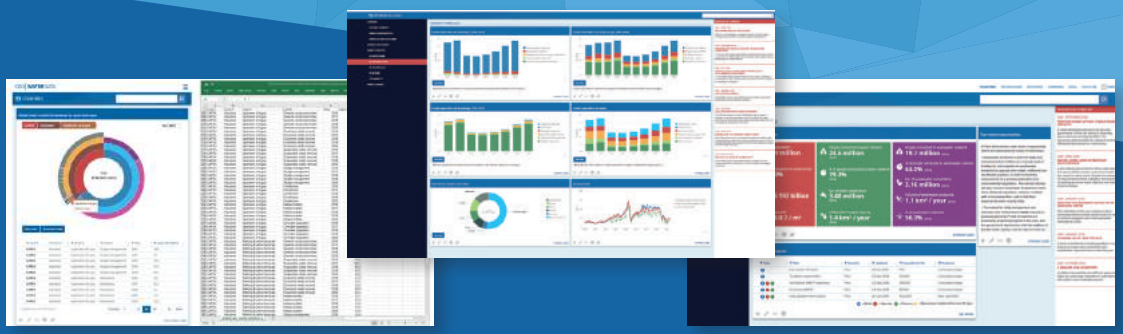

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> At small scale, MBBR is a lot easier to operate than activated sludge. When you have small settling tanks you will always have a challenge.
>
> Kim Sørensen, AnoxKaldnes

As a response to commoditisation, technology providers have different methods of counterattack. Most are placing emphasis on their holistic knowledge of each component within carrier-based systems, which helps the system run smoothly. Some providers, such as Israeli firm Aqwise, are offering engineering, procurement and construction (EPC) services to customers in order to stay competitive. The company aims to offer more in-depth expertise than an external engineering firm. "Supplying the full EPC can be a cheaper option, and we can also reduce the cost of the plastic. As a system supplier we also offer process assurance and higher quality media," added Harel Rauch, vice president at Aqwise.

Another strategy that MBBR providers are using to combat the proliferation of plastic media distributors is to offer a wide range of carriers for different applications *(see figure, above left)*. This not only allows for a more bespoke service, but also makes more complex media difficult to copy. For example, AnoxKaldnes, Veolia subsidiary and pioneer of MBBR technology, is offering 20 different media types. Its Z-carrier, although more expensive, has helped the company secure projects with challenging wastewaters , such as those containing micropollutants or high organic loads. "The Z-carrier is non-clogging because biofilm thickness is controlled by constant shaving," outlined senior process and technology expert Kim Sørensen. "It comes in different grid heights, allowing us to engineer for a thick or thin biofilm." Another of the company's media offerings, the F3, is an ideal match for the pulp & paper industry, where large amounts of fibres can often interfere with other carriers.

US-based firm Aquatech International claims its competitive advantage over carrier distributors is the unique design of its media. Unlike other plastic carriers, which can collect a build-up of dead biofilm (and therefore reduce the available surface area for treatment), the firm's offering is designed to cast off old cells. This maintains the efficacy of the treatment area even after the system has been operating for a significant period of time. "Our work has been backed up by a lot of studies. All these media suppliers don't conduct testing of their carriers," commented Aquatech managing director Devesh Sharma.

Biological nutrient removal

Another benefit that providers are exploiting in order to stay competitive is biological nutrient removal. Treatment of nitrogen and phosphorus, often without expanding the footprint of existing assets, is currently a hot topic for utilities and industries alike in many global regions. For these end users, modifying from an activated sludge to an IFAS is an ideal way of intensifying treatment, as well as adding both anaerobic and anoxic zones for the cultivation of nutrient-consuming bacteria. This is a service that commoditised media providers are not able to offer.

Carrier systems are also able to improve nutrient removal by retaining biomass in the system and thereby improve ecological system stability. A longer sludge age is more conducive to biological nutrient removal. Headworks International is experiencing a keen interest in IFAS and MBBR retrofits from UK utilities. "The UK is a very good market for MBBR and IFAS, because it's got 70 million people, high population density, good but old infrastructure, and a lot of it is activated sludge," explained Din. A reduction in nutrient discharge limits to below 1 mg/l during AMP7 is likely to increase the market potential in the region.

The MBBR pharma-nomenon

Although not a new market for MBBR/IFAS specialists, the technology is now gaining momentum in the pharmaceutical industry. Balancing a carrier-based system in extreme famine conditions, without going as far as depriving the system of all food sources, pushes the bacteria to consume pharmaceutical residues. These configurations can be offered to either pharmaceutical manufacturers or utilities as a secondary or tertiary solution, alongside ozonation and activated carbon, depending on how low the discharge requirements are.

The benefit to adding this technology over using ozonation and activated carbon alone is linked to the energy and operational expenditure reductions. Providers such as Veolia are beginning to build up more comprehensive internal catalogues of which drugs can and cannot be treated by the ▶

MARKET LANDSCAPE

Although AnoxKaldnes is widely referenced as the first company to commercialise MBBR technology, many of the industries' leading technology suppliers and EPC contractors have developed their own products.

Company	Product	Notes
Aquatech International	BioMOD MBBR	Packaged offerings
Aqwise	AGAR aerobic, DACS anaerobic	DACS offered through Aqana, Aqwise and Dutch Water Technologies joint venture
Envirogen Technologies	Suspended Carrier Reactor	-
Evoqua Water Technologies	BioSphere	-
H2O Innovation	Bio-Wheel IFAS	North America-focused
Headworks International	ActiveCell, EnergyCell, HIT System	Offers aerobic, anaerobic and anoxic configurations. Have also developed an anammox MBBR
Nijhuis Industries	BIOCTOR	-
Ovivo	Cleartec	-
Suez Water Technologies & Solutions	METEOR	-
Symbiona	FloBed	Offer MBBR/IFAS solutions alone, or as hybrid with MBR
Veolia Water Technologies	AnoxKaldnes MBBR	Pioneer of MBBR technology and has a wide range of variations on the technology for different markets
Wabag	FLUOPUR	-
Waterleau	-	-
World Water Works	Ideal MBBR/IFAS	-

Source: GWI

technology. Promising results from pilots of its eXeno product show the removal of selected antibiotics, anti-inflammatory painkillers, beta blockers and antidepressants.

In areas where reuse of water for irrigation is commonplace, such as Israel, attention is being drawn to the potential pollution of groundwater sources with pharmaceutical residues. In the vast majority of wastewater treatment plants they are currently not removed, even in those treating for reuse. Aqwise believes that the treatment of groundwater using MBBR for this application is one to watch, especially considering aerobic treatment can also be used for the treatment of nitrates in drinking water. The company currently has two drinking water installations, including one in the Sdot Yam agricultural community in Israel, treating 1,300m^3/d of groundwater using its Moving Bed Denitrification (MBDEN) process.

Progressive utilities are showing interest in MBBR for the treatment of pharmaceutical residues, particularly in Europe, and technology companies are now waiting for more global regulatory change to propel the market further. Switzerland is already ahead of the game, with the introduction of a regulation in 2016 that stipulated the removal of a selection of micropollutants (some of which are pharmaceutical residues) to an average level of at least 80%. Around CHF1.2 billion (€1.1 billion) has been pledged in order to upgrade more than 100 treatment plants by 2035 (*see GWI September 2019, p32*).

It is, however, important to note that carrier technologies currently need reinforcing with ozone or activated carbon in order to reach levels this low. Nonetheless, in German states with dense populations living alongside farming and industrial activity, such as Baden-Württemberg and North-Rhine Westphalia, there are incentives from the state government for the installation of 'fourth stage' polishing treatment to remove micropollutants. Areas implementing governance on pharmaceutical residues that is less strict than that of Switzerland may be a key market for MBBR/IFAS providers in the future.

Packaged popularity

MBBR solutions lend themselves especially well to decentralised and packaged solutions because they are a continuous process with no return activated sludge, allowing the technology to operate without utility supervision. "At small scale, MBBR is a lot easier to operate than activated sludge. When you have small settling tanks you will always have a challenge," explained Sørensen.

Regions where the growth in population outstrips the spending on large scale infrastructure are key markets for technology providers, including south and east Asia. Furthermore, providers are finding a market niche in the Middle East, particularly within the municipal realm, as it is experiencing vast city growth and some settlements are not connected to the main sewer network. Egypt is a particular hotbed of activity as the growth in population, as seen elsewhere in the MENA region, is combined with older infrastructure than other local states.

Packaged MBBRs are also an attractive choice for end users in industrial markets, because small installations are easier to tailor to sites with challenging wastewaters. Aquatech International has found a foothold in such markets, with sales in oil & gas and steel manufacturing. "The oil & gas industry has a lot of specifications, whereas markets such as food & beverage and commercial accept any standard packaged products," outlined executive vice president Ravi Chidambaran. Packaged MBBRs can also be constructed and delivered in a short period of time, and less civil work is often involved.

Onwards to anaerobic applications

Industrial users are also a key market for anaerobic carrier technologies, particularly with those that experience granule stability issues in upflow anaerobic sludge blankets (UASBs) and expanded granular sludge beds (EGSBs). "Having bacteria attached to the carriers gives us a more stable process, and it enables a high quality of biogas," stated Rauch. The firm is the parent company of anaerobic MBBR leader Aqana, which offers its downflow anaerobic carrier system product in either an anaerobic/aerobic, or solely anaerobic configuration.

There are, however, some barriers that need to be overcome for MBBRs to flourish in anaerobic conditions. "I think there is a market for anaerobic MBBR, particularly in food & beverage, but it will take a lot of convincing and plants need to get some real data," explained Din, who also outlined that industrial testing takes longer to prove due to a range in wastewater characteristics. ■

Terminology

Activated sludge: a type of aerobic wastewater treatment involving the suspension of biological flocs in a lagoon, followed by a settling tank to remove the microbes.

Aerobic: biological treatment methods that utilise aeration for the survival of aerobic (oxygen loving) bacteria. The bacteria then consume organic matter and nutrients from the wastewater stream.

Aerobic granular sludge: biological flocs freely agglomerate into granules, as opposed to flocs. This creates a unique ecology within each granule that allows for superior treatment of nutrients, all inside one reactor.

Anaerobic: biological treatment methods that utilises no oxygen for the survival of anaerobic bacteria. These organisms then consume organic matter from the wastewater stream.

Anoxic: a biological treatment environment that contains no free oxygen, but may contain oxygen bound to other compounds. Bacteria then scavenge this from sulphates or nitrates.

Biofilm: a collection of microorganisms that are adhered to a surface. This is opposed to the growth of water treatment biomass in suspension, in configurations such as activated sludge.

Fixed-film system: refers to a biological treatment process that employs a medium including plastic, wood or other synthetic or natural material that will support biomass growth. MBBR and IFAS are two examples of this system.

Membrane bioreactor: MF/UF membranes are submerged into a biological treatment reactor, removing the need for a separate settling tank.

Plastic carriers: small polymer cylinders that are placed in an aerobic system and are usually porous in order to increase the surface area for treatment. A biofilm grows on the surface, consisting of pollutant consuming bacteria.

Sludge recycle: the process of removing settled sludge from a suspended floc system and recycling it into the raw wastewater entering the tank.

SMART WATER WATCH

Newly launched Idrica brings digital consultancy to new markets

A Spanish software firm has felt compelled to set up a new company to maximise its services in the digital sphere. How will it help utilities meet their digital potential?

The inception last month of Idrica, a company dedicated to digital consultancy, aims to build on its experience implementing GoAigua smart technology to take water utility digitisation to emerging markets.

Idrica's launch has been the culmination of over a decade of work. In 2006, Aguas de Valencia (now branded as Global Omnium – *see GWI September 2017, p52*) began experimenting with digital processes and infrastructure to optimise efficiency and detect leaks. The platform it developed integrated smart metering, billing system management and real-time data gathering with digital modelling to visualise every process across the utility's water system. Seeing a market for this beyond Global Omnium's area of operations, GoAigua was spun off in 2018 to export the technology.

GoAigua will now be a solution under the new Idrica banner, which will provide both support for the implementation of GoAigua's technology as well as tailored consultancy services, working with utilities to hone their existing digital structures and promoting digitisation in new markets.

"We don't just offer a smart technology. Idrica offers services to manage the entire water cycle," explained Idrica CEO Jaime Barba. "When building a digital service structure from the ground up, we'll implement the GoAigua solution, but if the technology is already in place, we provide water cycle management services that can work with and make the most of utilities' existing technology structures, increasing efficiency and suggesting process improvements."

Its pedigree as an off-shoot of a 129 year-old utility gives Idrica, it claims, important insight into utility needs. "Since we came from a water utility, our solutions and services are developed and calibrated by experts working in the water sector," said Chema Nebot García, Idrica's head of sales. "We're not just a start-up that's developed one specific solution to address a single problem. We understand that each utility has different needs and build strategies and solutions structures to match."

DIGITAL CONSULTANT

Jaime Barba heads up the new Idrica entity.

Source: Idrica

Idrica's relationship with Global Omnium has helped win over otherwise reticent customers who tend to see digital innovation as more of a risk than an opportunity. "The first place we implement our solutions is Global Omnium," Barba explained. "After that, we can go to other companies and show them we have validated the technology."

Equipped with this practical experience, Idrica believes it is well placed to export its technology to markets that have so far been slow to digitise. GoAigua has already enjoyed significant success in South America, something Idrica hopes to build on. Working with Empresa Pública del Agua (EPA) in Ecuador, GoAigua implemented a system that automatically managed invoices, debt, and meter failure. The reported result was an increase in turnover of 500% and a 20% reduction in utility costs.

> "Every utility is different. We understand that and that is why now is our moment to launch."
>
> Jaime Barba, Idrica

"There're a huge number of projects in South America related to centralisation, trying to reduce the non-revenue water by controlling distribution networks," said García. "This market is the perfect place to implement all the lessons we've learned in Europe, maximising the potential benefits for our clients."

Other target markets include the Middle East and North America. "In North America, utilities are open to smart water innovation but they rely on other companies' examples to validate technologies," explained García. "Working with Global Omnium, we have market validation straight away. We're about to sign our first 'proof of concept' agreements in the US in collaboration with a major utility. Our experience gives us a real edge when entering even mature markets."

Whether implementing GoAigua's input agnostic solutions or building on their example of how to maximise benefit from any technology, Idrica aims to provide service and water management structures with global application. "We are able to work with any hardware," said Barba. "If a client uses hardware we've not worked with before, we can adapt our platforms and develop the necessary services in as little as two weeks."

Idrica's integrated approach to solutions and services is the latest to try to coax the water sector into the digital world. "We are something like a water boutique, personalising our solutions and services to meet clients' exact needs," said Barba, summarising his company's approach. "Every utility is different. We understand that and that is why now is our moment to launch." ■

CTO OUTLOOK

Marrying up pretreatment and desal tech

The Shenzhen-listed system integrator Shanghai Safbon Water Service shares its technology strategy after three international technology acquisitions during 2016 and 2017. How can it unlock the value of its enlarged technology portfolio?

ALEXANDER WANG

General Manager, Shanghai Safbon Water Service

Alexander has been involved in the water industry for over thirteen years, with both an automatic control and environmental engineering background. Alexander also holds an MBA from Fudan University and an EMBA from Shanghai Jiaotong University.

What market drivers have been most important in shaping the direction of your technology strategy?

The increasingly stringent environmental regulations and their stronger enforcement in China are the most essential driver of our technology strategy. In the municipal water space, there is a great number of water and wastewater treatment plants that need to be upgraded to meet the tough standards; this accelerates the replacement of conventional treatment processes by a variety of advanced methods of smaller physical footprints, such as dissolved air flotation (DAF), ultrafiltration (UF) membranes and membrane bioreactors (MBR).

Meanwhile, the growing reuse and minimum liquid discharge requirements imposed on big industrial water consumers have opened up a greater demand for advanced water treatment solutions like reverse osmosis (RO) and brine concentration. To seize these opportunities, we acquired several innovative technology companies during 2016 and 2017 with the aims of establishing a more complete technology portfolio, including the desalination system integrator Doosan Hydro Technologies (DHT), DAF provider KWI and ceramic UF membrane supplier ItN Nanovation. These international acquisitions have also helped us overcome the language barriers in bidding projects overseas.

How is market demand driving your business?

Another important factor is the shift in market demand. We have been exploring the overseas desalination world as the domestic market for seawater desalination is seeing slow levels of growth over the past five years, mainly targeting the large-scale projects in the Middle East regions by providing technology solutions for the state-owned EPC contractors such as Shanghai Electric and Sepco III. Last year we secured the gravity filtration solution contract and DAF system contract of Taweelah desalination project in Abu Dhabi, of which Sepco III is the main EPC contractor and is in charge of the procurement of pretreatment technology solutions.

Besides this, we are also focused on combining and integrating our existing technologies into various packaged solutions that could be applied in seawater desalination.

> “In our DAF solution we are working hard to develop a better control of both number and size of the generated bubbles, in order to treat different waste streams at a higher efficiency.
>
> Alexander Wang, Shanghai Safbon

What are the key technology areas you are looking at in your R&D activity and why?

Currently we have three major areas of R&D focus. The first one is to develop a more cost-effective solution of both DAF systems and ceramic flat sheet membranes. For example, we have been testing the performance of ceramic membranes which are made of local ceramic raw materials provided by Aluminum Corporation of China, with the aim of further reducing the cost difference between ceramic and polymeric membranes.

Besides enhancing our current wastewater portfolio, we are also looking at sludge and hazardous waste management. The Chinese central authorities are tightening the standards of sludge as well. The composition of industrial sludge is evaluated before disposal, in order to decide whether to treat it as hazardous waste or just as a normal solid waste. So far, we have invested in two hazardous waste management centres in China using rotary kilns for hazardous waste incineration.

What gaps do you see in Shanghai Safbon's water technology portfolio that could be strengthened?

Taking our DAF solution as an example, we are working hard to develop a better control of both number and size of the generated bubbles, in order to treat different waste streams at a higher efficiency. Moreover, in the application space, we are also looking ▶

to enrich the material types of our flotation equipment beyond the common stainless steel materials (i.e. grade 304, 316, 316L). For example, we have tried to adopt the duplex stainless steel (i.e. grade 2205, 2507) in our DAF systems which is a great fit for the corrosive wastewater challenges and also seawater applications.

If considering acquisitions, would you be looking at start-ups or well established firms and why? What technology areas would these cover?

We are more interested in technologies which enable us to create a more comprehensive portfolio that could meet the needs of our clients from different sectors, for example the RO membrane technology which is widely applied in both seawater desalination and industrial wastewater reuse.

How are you looking to integrate Safbon's different technologies into a packaged solution, and what end-markets are you targeting with this? What benefits would it bring to a customer?

We have over a dozen water treatment packaged solutions, with most of them developed by integrating DAF equipment and ceramic membrane technology with our self-developed wastewater treatment techniques such as sludging drying. These integrated solutions and services are focused specifically on seawater desalination and centralised wastewater treatment of chemical industrial parks. For some industrial parks located in the north part of China where reuse is necessary, we will further combine an RO process into the integrated solutions and sell the treated sewage to the surrounding power plants. The packaged solutions make us more competitive in offering our clients a simpler, more efficient and compact way of implementing different treatment processes into one set.

Which is currently your best-selling solution or technology and why do you think that is?

Our technical offering for condensate polishing treatment of thermal power plant has long been the best seller. This solution integrates our self-developed technologies with Dow's ion-exchange resins. With the domestic market of thermal power industry becoming sluggish, we are now mainly promoting this solution in the overseas markets through cooperation with Shanghai Electric and DHT's customers such as Doosan and Samsung C&T.

Besides this, ceramic membrane technology is seeing increasing sales in recent years as well, benefiting from the large flux rate and strength in treating oily wastewater. We've secured several projects in the oil & gas, coal-to-chemical and mining industries. We also applied our ceramic flat sheet membrane systems in a 2,500 m^3/d municipal MBR wastewater treatment plant in Kunshan city in 2018, to treat the sewage to reach the 'Level IV' water quality standard.

How are you looking at greater involvement in the digital water space? What benefits will it bring to both your customers as well as Safbon itself?

The emergence of digital technology and big data analytics over the past five years has greatly changed the way we operate plants and deal with the collected data of water conditions. We've applied a digital water asset management software since 2018, which not only enabled us to monitor our twenty water and wastewater treatment plants online, but established an efficient way to identify, analyse and respond to the polluting activities and potential risks automatically.

Another digital solution that has caught the attention of the government and water utilities recently is the blockchain. Currently the environmental-related data collected from monitoring equipment are mostly saved in the Environmental Protection Bureaus of China. If blockchain technology could be utilised, all the digital records of water will be able to be stored in a more secure, controlled and auditable way at different locations.

What technologies will be most needed for China to meet its ongoing environmental goals?

From my perspective, the membrane technologies are of the highest demand. The reuse requirements in both municipal and industrial sectors in China are facilitating the application of both low pressure membranes and RO solutions. Nanofiltration membrane technology is also promising driven by China's pursuit of "High Quality Drinking Water" initiative, though it is currently at an initial stage.

What do you think will be the game changing technologies in the water sector in the next ten years? What is ripe for disruption?

Facing the challenge of serious water scarcity, minimising the discharged liquid and maximising the usage of unconventional water resources are already a global trend. Nevertheless, solutions such as brine concentration and seawater desalination are all energy intensive. Developing cost-effective pretreatment technologies that enable a better water quality for the downstream reverse osmosis (RO) process could be a big step moving forward. ■

PRETREATMENT FOR AN SWRO

Safbon and its Austrian subsidiary KWI were awarded the whole pretreatment system comprising dissolved air flotation and dual media gravity filter for the 900,000m^3/d Taweelah SWRO project in the UAE.

Source: Shanghai Safbon

FIRST REPORT

Charting start-ups' journeys: volume four

CTO revisits some of the technologies assessed in the First Report section to check on progress. This month: Blue Foot Membranes goes vertically integrated; Hydroleap targets the palm oil market; and Zilper pushes into the US market with its trenchless technology.

SHAKING UP THE MBR MARKET

A recent asset purchase and €2.8 million capital raise towards the end of 2019 has readied Blue Foot Membranes (*see GWI April 2018, p51*) for taking on the world with its novel Integrated Permeate Channel (IPC) membrane technology. Late 2019 saw BFM acquire the assets and IP of MaxFlow Membran Filtration GmbH (MMF) and A3 Water Solutions, giving the firm fully vertically integrated module production capabilities.

CEO Patrick Vanschoubroek told GWI that BFM has successfully paired its IPC membrane with a triple deck module configuration at the Rendac facility in Belgium, which can significantly increase the output of the system per square metre of membrane area. The asset purchase also gives BFM a sizeable replacement market of MMF's installed base, but the firm has no designs on becoming a turnkey membrane bioreactor provider (the IPC membrane is predominantly used in MBRs at the moment).

A recently installed second production line gives the company the opportunity to look at serving the higher flow municipal wastewater market. BFM has commercial industrial wastewater plants running in Belgium and is now commissioning plants in Germany, Indonesia, the Netherlands, Turkey, India and Japan through partners. The next targets for international growth are the Middle East, China and the USA. The capital raise involved existing investors VITO, Qbic II, LRM and the Innovation Fund.

GWI verdict: Energy consumption is a big deal for MBRs. Operational data from BFM's plants will make interesting reading.

LEAPS AND BOUNDS

Another company with a significant funding round towards the end of 2019 was Singapore-based Hydroleap (*see GWI May 2018, p63*). The SG$2.6m ($1.87m) raise was aimed at kickstarting the company's growth into other industrial verticals. Since the end of 2018 Hydroleap has a number of commercial references in the Singapore construction sector, treating total suspended solids in wastewater. In this application it has typically paired its electrocoagulation system with ceramic or polymeric membranes and offers modular systems of up to 60m³/h.

After establishing the beachhead market, Hydroleap is now about to commission its first project in the palm oil industry in Malaysia, where its 400 m³/d system will treat effluent from a biological process up to discharge standards. The company continues to pilot systems in industrial wastewater treatment for reducing hardness and is also interested in desalination pretreatment, where it could replace chemical treatment.

R&D focus has been maintained on enhancing the electrocoagulation process further, including using metallic waste for further reducing the maintenance and replacement cost. It is also piloting non-sacrificial electrodes for use in systems aimed at removing chemical oxygen demand.

Hydroleap is now looking to hire more personnel including electronics engineers and process engineers as it looks to the next stage of its growth.

GWI verdict: Electrocoagulation has not really taken off beyond the construction sector so performance in palm oil is eagerly anticipated.

TRENCHLESS TRIALS

Since GWI last checked in with Zilper Trenchless (*see GWI August 2018, p41*), the company sold its first commercial machine to Colombian construction company Aqua Ingenieros. With its alternative to auger boring and pipe ramming, Zilper can install meral casings between 8 and 44 inches in diameter without any further investment on parts. The firm has conducted a number of projects installing stormwater pipes with diameters between 24 and 42 inches. For one project it managed to install 300 feet of 36-inch diameter pipe using a 12-inch rammer.

Initially, the company planned to sell its machine to clients, but due to some pipe installation projects not being expansive enough to warrant an equipment purchase, Zilper instead leases its machine, charging clients on the basis of pipe diameter and length. It is now working on a new guidance system for its machine with the aim of making it fully automated in the next two years.

After landing a pilot with a utility to use the machine for laying an 18-inch pipe in the US state of Indiana (which will begin in May), the company has made Indianapolis its headquarters, and is closing a round of funding to support its entry into the US market. Zilper is also eyeing expansion overseas, anticipating a product ready for shipping in the next 12 to 18 months.

GWI verdict: The change of business model has improved the outlook for the company. ■

NEW HORIZONS

Companies featured this month have set their sights on new horizons, be it business models or industrial and geographic markets.

Company	Technology	Market addressed	First reviewed	Rating*
Blue Foot Membranes	Integrated Permeable Channel (IPC) membranes for MBRs	Wastewater treatment	April 2018	2/3
Hydroleap	Smart Electrocoagulation	Industrial wastewater treatment	May 2018	1/3
Zilper Trenchless	Assisted Dynamic Boring	Pipe installation and rehabilitation	August 2018	1/3

**At time of first review: 0=unrated; 1=interesting; 2=worth a detour; 3=worth a journey*

Source: GWI

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Ryan Yuen
Managing Director

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GWI PROJECTS

The Bern regional WWTP serving Switzerland's capital is one of over 100 plants set to be upgraded to treat micropollutants in the country by 2040.

ADVANCED WWTPS

Where are the high-end wastewater projects?

GWI looks at the wave of advanced wastewater treatment projects being rolled out across Europe. What are the key market drivers?

This month, the GWI Project Tracker shines the spotlight on a wave of tertiary wastewater projects in Europe. Enhanced nutrient removal has been on the agenda on the Old Continent for some decades already, thanks to the requirements introduced by the then-European Community's 1991 Urban Wastewater Treatment Directive (UWWTD), but it is now seeing a wave of renewed interest.

Today, factors ranging from the the influence of EU regulations on new and aspiring members to the need for infrastructure renewal in mature markets are bringing about a new batch of tertiary projects. In some parts, the latest technological advances are prompting rich utilities to seek even more advanced treatment, often setting their sights on the emerging issue of micropollutants.

Switzerland's $1.2 billion upgrade programme is the most spectacular example of the latter. Following a 2016 law, the federal government is subsidising mandatory upgrades to over 100 WWTPs across the Alpine country to remove most micropollutants from wastewater (*see GWI September 2019, p32*). Many of these projects are set to be small – with capacities as low as 8,000 p.e. – but others represent major opportunities.

Geneva is planning to upgrade and expand two of its plants, including Switzerland's largest at Aïre. The plant will be enlarged to 1 million p.e. and fitted with a 300,000m³/d ozonation unit, followed by sand filtration which may in future use granular activated carbon (GAC). Tenders for parts of the CHF115 million ($116 million) project may come as early as next month. Major upcoming retrofits in the country's German-speaking cantons include Bern and Luzern's respective central WWTPs.

Municipalities in the French-speaking canton of Vaud are taking advantage of the subsidies to centralise wastewater treatment capacity in new regional plants, such as the upcoming 120,000 p.e. APECplus facility near Gland, set to be completed in 2025. A similar project is planned by utility SIGE in Villeneuve, near Montreux, to serve over 110,000 people.

Other projects aiming to tackle emerging pollutants are cropping up in Swe- ▶

KEY ADVANCED WASTEWATER TREATMENT PROJECTS

GWI's project tracker is closely following the key European opportunities for advanced wastewater treatment.

Technology	Tertiary treatment	Nutrient removal	Disinfection	Micropollutant removal	Reuse
Number	29	14	3	9	3

Source: GWI

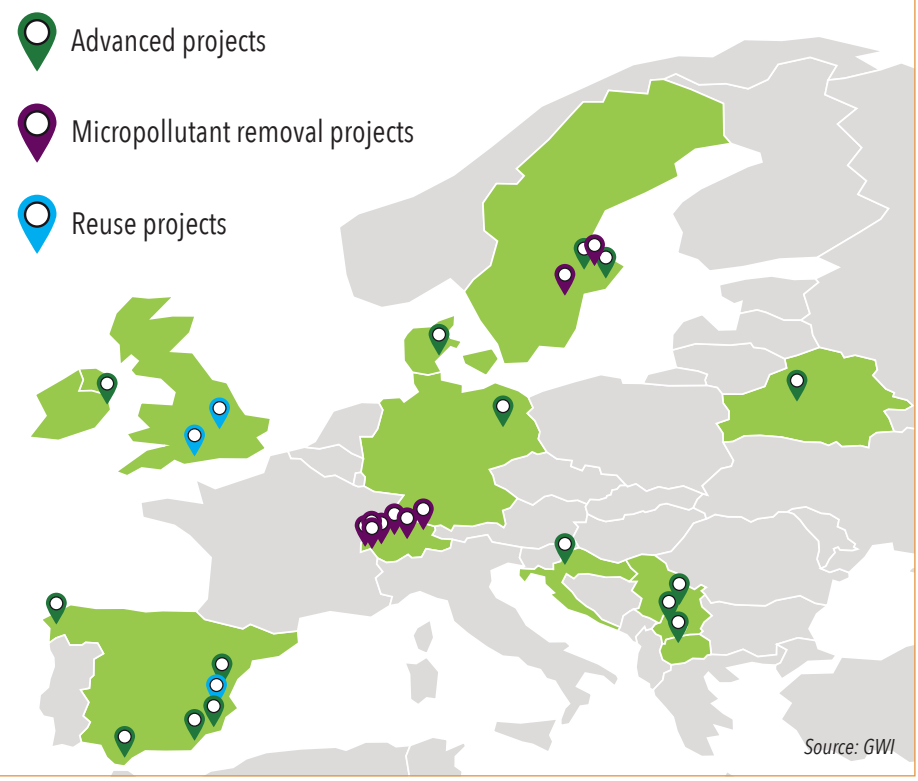
den, where high tariffs are allowing utilities to act on the Swedish public's sensitivity to environmental protection. Projects such as the new 65,000 p.e. Ängens plant and the expansion of Uppsala's 200,000 p.e. Kungsängsverket WWTP to 300,000 p.e., which form part of a broader wave of infrastructure renewal in Scandinavia (*see story p17*), are planning to include ozonation and activated carbon, respectively. Other projects, including the Vappa WWTP in Enköping, are saving micropollutant removal for a later expansion stage.

Across the Øresund, in Denmark, the country's second-largest city of Aarhus has set in motion an ambitious plan to design a new plant collaboratively with the private sector through an innovation partnership (*see GWI May 2019, p18*). The aim is to obtain a fully circular "resource factory" with facilities to test and implement future innovations on a rolling basis after the plant's commissioning in 2026. Statements of qualification for the design consortium can be submitted until 9th March.

While Scandinavia forges ahead with the latest innovations, much of Southern Europe is making strides in catching up to UWWTD requirements. Spain's well-established trend to equip WWTPs with tertiary treatment for agricultural reuse of the effluent is also contributing in reducing the country's "distance to compliance" with article 5 of the UWWTD – a gap of over 6 million p.e. according to the latest figures from the European Commission. By contrast, the lack of activity in Italy may partly account for the 11.5 million p.e. gap between the amount of tertiary treatment in place and that mandated by Brussels, which has imposed heavy fines on Rome in recent years.

THE CRUCIAL MARKETS FOR ADVANCED WWTPS

While Switzerland is pushing the envelope on micropollutant removal, markets like the UK, Spain and Sweden have also become hubs for the advanced end of the wastewater treatment project market.



In the Balkans, new and aspiring EU members are ramping up nutrient removal capacity in larger cities with financial help from the European bank for Reconstruction and Development (EBRD) and European Investment Bank (EIB). There, too, UWWTD requirements are the goal that utilities and their financiers aim for. The €60 million project to upgrade the 1.25 million p.e. WWTP serving Croatia's capital Zagreb to tertiary level is the region's flagship retrofit project in the EU's newest member. However the capital of recently renamed North Macedonia, Skopje, steals the show with a €137 million DBO for a brand new 130,000m³/d plant, for which tendering was imminent as GWI went to press. ■

WATER DESALINATION REPORT

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GWI
WATER IS OUR CONCERN

DEEP TUNNELLING

Water drives the growing deep-tunnel market

Key deep-tunnel projects are unearthed in GWI's recently-relaunched water project tracker. They are driving a not-so-boring market.

Suppliers of large-diameter tunnel boring machines (TBMs) are increasingly turning their eyes to the international water market, as climate change-driven flooding risks and increasingly stringent water pollution regulation push utilities to invest in large-scale sewer overflow and flood management tunnels. While water-and sewerage-related opportunities account for just 5% of the TBM market in a sector dominated by transportation projects, water-related projects are estimated to outperform the rest of the tunnelling market with a compound annual growth rate of 6% which is expected to boost global spending to $836.56 million by 2025, according to figures from Allied Market Research.

The greatest deep sewer and drainage tunnel opportunities linked to water are currently concentrated in the North America region where municipalities in the United States of America (USA) are scrambling to comply with federal consent decrees that mandate them to address sewer overflows. Asia represents a rapidly growing market particularly as countries like China and Thailand attempt to address perennial flooding issues and India tightens its water pollution control. There is also slow but steady growth of water-and-sewer tunnel construction in the European region where major cities are expected to fulfil the pollution control measures outlined in the Urban Wastewater framework directive.

Some of the major players in the TBM sector set to benefit from the growing tunnelling opportunities in the water sector include Herrenknecht Ag, Hitachi Zosen Corporation, the Robbins Company, CREG, SELI and Qinhuangdao Tianye Tolian Heavy Industry Co., and all are understood to be closely following the development of major water-led projects.

The water-and-sewer tunnelling market is driven by the major EPC companies such as Salini Impregilo, Bechtel, Vinci, Morgan Sindall, J. Murphy and Sons, Jacobs Tunnelling, Samsung, Balfour Beatty, PORR Ag and Joseph Gallager Limited (JGL). The highlighted EPC companies have been involved in the construction of massive sewer and water tunnel projects around the world including the Strategic Tunnel Enhancement Programme (STEP) in the United Arab Emirates (UAE), the Anacostia River Tunnel in the United States, the Deep Tunnel Sewerage System (DTSS) in Singapore and the the ongoing Thames Tideway Tunnel in the United Kingdom.

GWI has captured some of the major deep tunnel sewer/drainage projects set to be rolled out around the world in its newly relaunched project tracker. Six projects from different global regions are outlined in the table above, and more are being added to the tracker every month. ■

KEY DEEP-TUNNEL PROJECTS IN THE GWI TRACKER

Deep-tunnel opportunities driven by water utilities have created a huge market for design consultants, major EPCs, and tunnel boring maching suppliers.

Project Name	Country	Design consultant	Project cost ($ million)	EPC contractor appointed (est.)
The DC & RW Waterfront tunnels, Ontario	Canada	Black and Veatch	1,880*	2020
Svanemøllen Cloudburst Tunnel	Denmark	COWI	226	2021
Shoreline Storage Tunnel, Ohio	USA	McMillen – Jacobs Associates	204	March 2020
Lower and Middle River des Peres Tunnel, Missouri	United States of America	Jacobs Engineering	631	2027
Khlong Phraya Ratchamontri Tunnel	Thailand	Information not available	197	Mid-2020
Dubai Strategic Sewerage Tunnel Project -Deira and Bur Dubai Tunnels.	United Arab Emirates	Parsons International	1034.72**	June 2020

** Combined cost of three DC & RW tunnels*

*** Combined cost of bothe Deira and Bur Dubai*

Source: GWI

PROJECTS

What happened in GWI's water project tracker in February?

Since the publication of the last issue of GWI, 242 updates were added to the project tracker database.

Project type	Deep Tunnel	Desalination	Sludge	Utility	Water Transfer	Water Treatment Plants	WWTPs	All	(Industrial)
New	1	4	2	14	2	2	18	43	0
Awarded	0	5	0	4	0	2	12	23	2
Updates	2	33	4	53	7	23	120	242	10

Source: GWI project tracker

PROJECT TRACKER

Broad interest for Saudi ISTPs; Western Galilee tender kicks off; Sydney's dams fill up; Flanders eyes centralised sludge PPP; Brazilian action awaited; all the latest project news from around the world.

LOCAL HEROES

● Foreign firms will have their pick of local partners when it comes to bidding for a new round of independent sewage treatment plants in Saudi Arabia. 26 out of the 65 firms which expressed interest for the Buraidah and Tabuk plants earlier this month are based locally, while 23 out of the 62 interested parties in the Medina ISTP are local.

● Local interest is also likely to be strong when it comes to submitting statements of qualification for Israel's long-planned Western Galilee desalination plant. The Israeli Water Authority last month set a date of 4th March to receive SoQs for the 100 million m³/year facility, which will be procured under a 25-year BOT contract.

DROUGHTS AND FLOODS

● With the low snowpack in California causing increased amounts of unease in the state, it comes as a relief that plans for advanced reuse infrastructure are turning into reality. The City of Oceanside has broken ground on a 17,000m³/d triple-barrier treatment project designed to skew the city's resource balance away from imported water. There are more indirect potable reuse projects to come in San Diego County (*see story p24*).

● The sudden abundance of water in Sydney after recent rains threatens to throw the timing of the planned large-scale desalination expansion into doubt. When local dam levels were below 40%, design work was in full swing, but with those same dams now at 80% of capacity, it remains to be seen whether the authorities can convince ratepayers to pay the necessary insurance premium to drought-proof their supplies in preparation for the next drought.

PICK OF THE PPPS

● Belgian utility Aquafin is proposing to take a 25% equity stake in a new PPP that will offer a centralised sludge management solution for the Flanders region. It has invited prospective project developers to enter into a competitive dialogue phase ahead of a formal procurement process later this year (*see story p21*).

● Things are hotting up on the concessions front in Brazil: as GWI went to press, the market was awaiting an RFP for a contract in Maceió (Alagoas), while a public consultation period ends on 4th March ahead of a wastewater PPP for Sanesul (Mato Grosso do Sul).

● For all the latest updates from around the world, visit our website's Project Tracker: http://tinyurl.com/gwi-tracker. ■

WHAT'S HOT THIS MONTH?

Ten water and wastewater projects to watch in GWI's project tracker this month.

No.	Name	Description	Update
1	Newtown Creek CSO tunnel, NY	2.5-mile long CSO storage tunnel	NYCDEP has confirmed that it plans to issue an RFP for planning and design services relating to the Newtown Creek CSO facilities in Q1 2020.
2	Souk Tleta rehabilitation	Rehabilitation of 200,000m³/d desalination plant	Bidders have until 23 March 2020 to submit their offers, and the bid evaluation process is likely to take three months.
3	Vadinar Refinery SWRO	24,000m³/d SWRO plant	A tender has been released, and pre-bid meetings have been scheduled for 25 and 26 February 2020. The bid submissions deadline is 16 March 2020.
4	Western Galilee	274,000m³/d desal plant	A request for statements of qualification has been issued by the client. The deadline for submissions is 1st June 2020.
5	Flanders sludge treatment	Centralised sludge treatment facility	Proposals from project developers interested in entering into a competitive dialogue phase are due in by 9th March 2020.
6	Sanesul PPP	Wastewater PPP	The public consultation period runs until 4th March 2020. The tender process is expected to start later in the first half of 2020.
7	Miyagi concession	Water and wastewater treatment concession	Teams are understood to be mobilising around Veolia/Metawater, Suez, and JFE Engineering ahead of an RFP, which could be released in March 2020.
8	Gammams DPR plant	25,000m³/d direct potable reuse facility	The municipality plans to issue an RFP in Q3 2020 for a consultant to work on design and procurement, with a consultancy award to follow by December 2020. An RFP for the construction contract is then expected in Q3 2021.
9	Buraidah 2 ISTP	150,000m³/d sewage treatment plant	A request for qualifications has now been issued to interested parties. The request covers both this project and the Tabuk 2 ISTP. 65 companies expressed interest in the Buraidah 2 and Tabuk 2 ISTPs.
10	West Saigon WWTP	150,000m³/d WWTP	The Asian Development Bank (ADB) is involved in supporting the project, and in February 2020 shortlisted consultants to support the project preparation phase.

THE GWI PROJECT TRACKER – FEBRUARY 2020

All the project updates generated in the last month in the key markets tracked by Global Water Intelligence.

B Build O Operate F Finance

DEEP TUNNEL SEWER

Type	Country	Project name	Description	Status
B	United States	Harris County stormwater tunnel, TX	10-mile deep tunnel sewer	Second phase study consultant selected
B	United States	Newtown Creek CSO tunnel, NY	2.5-mile long CSO storage tunnel	Design RFP expected in Q1 2020

DESALINATION PROJECTS

Type	Country	Project name	Description	Status
B O F	Algeria	Alger West SWRO (Fouka Marine)	300,000m³/d SWRO	Contract award due in March 2020
B O F	Algeria	El Tarf	300,000m³/d SWRO	Contract award due in March 2020
B	Algeria	Guerbes SWRO	70,000m³/d SWRO desalination plant	Award expected in April 2020
B O	Algeria	Souk Tleta rehabilitation	Rehabilitation of 200,000m³/d desalination plant	Bids due in March 2020
B	Australia	Belmont desalination plant	Seawater desalination plant	Expansion of plan being considered
B	Australia	Sydney desal expansion	250,000m³/d SWRO expansion	Conceptual stage
B O F	Brazil	Fortaleza SWRO	86,400m³/d desal plant	Tender awaited
B	Chile	Los Pelambres	34,560m³/d seawater desal plant	Contract awarded
B	India	Tuticorin FGD desal	8,640m³/d RO plant for process water	Bids due in February 2020
B O	India	Vadinar Refinery SWRO	24,000m³/d SWRO plant	Bids due in March 2020
B O F	Israel	Western Galilee	274,000m³/d desal plant	RFQ issued
B O	Kiribati	South Tarawa Water Supply Project	4,000m³/d solar-powered SWRO	RFP expected in late Q2 2020
B O F	Mauritania	Northern Zone water supply PPP	Potential seawater desalination plant	Consultancy SoQs due in February 2020
B O F	Mexico	Cabo San Lucas expansion	21,600m³/d desal plant	Tender anticipated in March 2020
B O F	Namibia	Erongo region desalination	Coastal desalination facilities serving local and inland areas	Feasibility study ongoing
B O	Palestine	Gaza Desalination Plant	150,000m³/d SWRO	TA EoIs due in March 2020
B O F	Peru	Ilo desal plant (Moquegua)	37,000m³/d desal plant	Proposal selected for evaluation
B O F	Qatar	Facility E IWPP	Independent water and power project	Bids due in April 2020
B	Saudi Arabia	Jubail 1 replacement SWRO	400,000m³/d SWRO plant	Contract awarded
B O F	Saudi Arabia	Jubail 3b IWP	570,000m³/d desal plant	Potential frontrunner emerges
B	Saudi Arabia	Khobar 2 replacement SWRO	600,000m³/d SWRO plant	Contract awarded
B O F	Saudi Arabia	Yanbu 4 IWP	450,000m³/d SWRO plant	Preferred bidder confirmed
O	Spain	Palma Bay SWRO O&M, Mallorca	O&M of 64,800m³/d desal plant	Bids due in March 2020
B	United States	Monterey Peninsula Water Supply Project, CA	36,366m³/d SWRO	Permitting applications underway
B O	United States	North Pleasant Valley Water Desalter, CA	30,400m³/d desal plant	Construction underway
B	United States	Oceanside, CA	18,925m³/d seawater desal plant	RFP for brine minimiser expected in Q1 2020
B	United States	Salinas Valley brackish desal, CA	50,692m³/d brackish water desal plant	Conceptual stage
B	United States	Thousand Oaks BWRO, CA	1MGD brackish water RO plant	Pilot phase complete
B	United States	WRD saline plume remediation, CA	Up to 67,589m³/d of desalination capacity	Feasibility study underway

SLUDGE MANAGEMENT

Type	Country	Project name	Description	Status
B O F	Belgium	Flanders sludge treatment	Centralised sludge treatment facility	Initial responses due in March 2020

Type	Country	Project name	Description	Status
B	Germany	Nuremberg sludge plant	New 30,000 tDS/y sludge treatment facility	Consultancy EoIs due in March 2020
B O	Italy	Valle del Chiampo sludge management	Sludge management project	Bidding deadline pushed to April 2020
B O F	United States	Charlotte Water nutrient harvesting, NC	Nutrient harvesting project	SoQs due in February 2020
UTILITY PROJECTS				
B O F	Brazil	Andradas concession	Water and wastewater concession	Responses due in March 2020
B O F	Brazil	Consana concession	Water and wastewater concession	Market sounding underway
B O F	Brazil	Granja concession	Water and wastewater concession	Bids due in March 2020
B O F	Brazil	Ipameri concession	Water and wastewater concession	SoQs due in March 2020
B O F	Brazil	Paraíba do Sul concession	Water and wastewater concession	Bids due in March 2020
B O F	Brazil	Potim concession	Water and wastewater concession	Six proposals received
B O F	Brazil	Sanesul PPP	Wastewater PPP	Tender expected in H1 2020
O	Canada	Haldimand County O&M renewal, ON	O&M of water infrastructure	Bids due in March 2020
O	Canada	Kawartha Lakes O&M renewal, ON	O&M of water and wastewater assets	Contract awarded
B O F	Canada	Mapleton DBFOM, ON	DBFOM of water and wastewater assets	Award likely in Q1 2020
O	Canada	Squamish-Lillooet O&M, BC	O&M of water and wastewater assets	Bids due in March 2020
B O	India	Gandhinagar 24x7 water supply	24x7 water supply	Bids due in February 2020
B O	India	Shimla 24x7 water supply	24x7 pressurised water supply	Three bids received
B O	India	Shimla bulk water supply scheme	42,000m³/d water treatment plant	Four bids under evaluation
B O	India	Tonk STPs and water supply	Water supply + 20,000m³/d of WWTP capacity	Single bid under evaluation
B O F	Japan	Miyagi concession	Water and wastewater treatment concession	RFP possible in March 2020
B O F	Saudi Arabia	Saudi regional concessions	Regional water concessions	Bids submitted
O	Spain	Aguas de Añarbe, San Sebastián	O&M of water and wastewater assets	Contract awarded
O	United States	Brighton O&M renewal, MI	O&M of wastewater assets	Conceptual stage
B O F	United States	Bureau of Reclamation P3s	Multi-state P3s	Conceptual stage
O	United States	Cape Canaveral AFS / Patrick AFB privatisation, FL	Military privatisation	Bids due in May 2020
O	United States	Cheyney University O&M renewal, PA	O&M of wastewater treatment plant	Two bids under evaluation
O	United States	City of Red Bluff O&M, CA	O&M of wastewater assets	SoQs due in February 2020
O	United States	City of Willows O&M, CA	O&M of wastewater treatment plant	Conceptual stage
O	United States	Conroe ISD O&M, TX	O&M of water and wastewater assets	Bids due in March 2020
O	United States	Dracut O&M renewal, MA	O&M of wastewater assets	Three bids received
O	United States	Dundee O&M, MI	O&M of wastewater assets	Contract awarded
O	United States	Fulton County O&M renewal, GA	O&M of wastewater assets	Monitoring bids due in February 2020
O F	United States	Hallsville system sale, MO	Sale of wastewater collection system	Three bids under evaluation
O F	United States	Harrisburg privatisation, PA	Water, wastewater and stormwater system privatisation	Conceptual stage
O	United States	Highland Park O&M, NJ	O&M of water and wastewater assets	Bids due in February 2020
O	United States	Hingham O&M, MA	O&M of water infrastructure	Preferred bidder identified
O	United States	Holmdel Township O&M, NJ	O&M of wastewater assets	Contract awarded
O	United States	Kenwood O&M, MA	O&M of water infrastructure	Bids due in February 2020
O	United States	Mantua O&M, OH	O&M of water and wastewater assets	Bids due in February 2020

Type	Country	Project name	Description	Status
O	United States	Mercedes O&M, TX	O&M of water and wastewater assets	Re-tender awaited
O	United States	MWRA pelletising plant O&M, MA	O&M of pelletising plant	RFP likely in early 2020
O	United States	New Bedford O&M, MA	O&M of 83,270m³/d WWTP	Three bids under evaluation
O F	United States	New Hartford system sale, CT	Sale of water and/or sewer systems	Referendum awaited
O	United States	NJ Turnpike Authority O&M renewal, NJ	O&M of water and wastewater assets	EoIs due in March 2020
O	United States	Rocky Mountain Arsenal O&M, CO	O&M of water treatment plants	LoIs due in February 2020
O	United States	Rosenberg O&M renewal, TX	O&M of water and wastewater assets	Single bid under evaluation
B O F	United States	Salinas stormwater P3, CA	30-year green stormwater P3	RFQ response under evaluation
O	United States	South Bay O&M renewal, CA	O&M of 94,625m³/d secondary WWTP	Conceptual stage
O F	United States	St. Joseph sewer system sale, MO	Potential sale of wastewater system	Conceptual stage
O F	United States	Wilkes-Barre sewer sale/lease, PA	Sale or lease of wastewater collection system	Fresh proposals requested
O	United States	Wilmington O&M, DE	O&M of wastewater assets	Preferred bidder identified
WATER TRANSFER				
B	Australia	Nathan Pipeline and Dam Project	149.3km trunk pipeline	Feasibility study to be conducted
B O F	Colombia	Santa Marta concession	Aqueduct plus WWTP	Project on hold
B O F	Pakistan	Ghazi-Barotha Water Transfer Pipeline	60km water transfer pipeline	Consultancy tender postponed
B	United States	Arkansas Valley Conduit, CO	130-mile water transfer pipeline	$28m in federal funds secured
WATER TREATMENT PLANTS				
B F	Argentina	Santa Fe WTP	150,000m³/d WTP	Decision from provincial legislature delayed
B O F	India	Beed District WTPs	255,000m³/d of water treatment capacity	SoQs due in March 2020
B O	India	Bhagalpur WTP	90,000m³/d water treatment plant	Contract awarded
O	India	Bhaklai WTP O&M	O&M of 363,000m³/d WTP	Single bid under evaluation
B O	India	Jalandhar Water Supply Project	275,000m³/d water treatment plant	Bids due in February 2020
B O F	India	Latur & Osmanabad district WTPs	370,000m³/d of water treatment capacity	SoQs due in March 2020
B O F	India	Marathwada WTPs and water supply	Regional water treatment and supply project	SoQs due in March 2020
B O	India	Patiala & Fatehgarh Sahib WTPs	69,000m³/d of water treatment capacity	Bids due in February 2020
B O F	India	Patiala 24x7 water supply	115,000m³/d water treatment plant	Bids due in February 2020
B O F	India	Punjab villages water supply	Drinking water supply for 257 villages	Bids due in March 2020
B O	India	Ranchi WTP	213,000m³/d water treatment plant	Bids due in February 2020
B O	India	Silchar water supply project	27,000m³/d water treatment plant	Contract awarded
B O	India	Wazirabad WTP - Project 1	Improve water supply system	Network bids due in March 2020
B O F	Indonesia	Jatiluhur 1	Two new WTPs	New pre-qualification process underway
B O F	Iran	Narmab Dam WTP	95,000m³/d water treatment plant	SoQs due in February 2020
B O F	Peru	Lima potable water project	Concession, including a new WTP	Re-tender possible in Q3 2020
B O F	United States	Joliet WTP, IL	New surface water treatment plant	Consultancy SoQs due in Feb 2020
WASTEWATER TREATMENT PLANTS				
B	Denmark	Aarhus ReWater Resource Recovery Facility	New 550,000 PE WWTP	EPC tender closes in April 2020
B	Egypt	Alexandria West WWTP expansion	139,000m³/d WWTP expansion	EIB funding approved
B O	Egypt	Al-Tod WWTP	New 13,000m³/d WWTP	Tendering expected in Q2 2020
B O	Egypt	Keman El Matana WWTP	New 22,000m³/d WWTP	Tendering expected in Q2 2020

Type	Country	Project name	Description	Status
BO	India	Ahmedabad STPs (Makarba & Chandola)	2 x 5,000m³/d WWTPs	Bids due in February 2020
BO	India	Ahmedgarh STP	5,000m³/d sewage treatment plant	Single bid under evaluation
BO	India	Baharampore and Jangipur WWTPs	Three STPs (total capacity 16,500m³/d)	Contract awarded
BOF	India	Balasinor STP	6,500m³/d STP for industrial reuse	Bids due in February 2020
BO	India	Bandra WWTP	360,000m³/d wastewater treatment plant	Bids due in February 2020
BO	India	Bangalore peripheral STPs	53,000m³/d of new capacity across seven WWTPs	Bids due in March 2020
BO	India	Barhi CETP	10,000m³/d industrial CETP	Re-tender awaited
BO	India	Batala STP	30,000m³/d sewage treatment plant	Bids due in February 2020
BO	India	Bhavnagar STP (Akwada)	19,200m³/d sewage treatment plant	Bids due in March 2020
BO	India	Chandigarh Smart City STPs	Construction and rehabilitation of STPs	Re-tender awaited
BO	India	Delhi (Narela) STP rehabilitation	Upgrade of 45,460m³/d STP	Bids due in March 2020
BO	India	Faridabad (Badshahpur 2) STP	30,000m³/d sewage treatment plant	Bids due in February 2020
BO	India	Gurugram STP	10,000m³/d sewage treatment plant	Contract awarded
BO	India	Hajipur CETP	5,000m³/d CETP	Bids due in February 2020
BO	India	Haldwani STP	28,000m³/d sewage treatment plant	Contract awarded
BO	India	Jaipur STPs upgrade	New 90,000m³/d STP + upgrade of 2 x 62,500m³/d STPs	Bids due in February 2020
BO	India	Jalandhar STPs	New 50,000m³/d STP + rehab of 100,000m³/d STP	Bids due in February 2020
BO	India	Jaunpur STP	30,000m³/d sewage treatment plant	Contract awarded
BO	India	Kolkata STPs	Build and rehabilitate WWTPs	Bids due in February 2020
BO	India	Kundli CETP upgrade	6,000m³/d tertiary upgrade	Contract awarded
BO	India	Lucknow STPs	Construction of two new STPs	Bids due in March 2020
BO	India	Ludhiana STPs and ETPs	Construction and rehab of multiple STPs	Bids due in March 2020
BOF	India	Maheshtala and Hoogly-Chinsura STPs	Build/rehab 59,500m³/d of WWTP capacity	Maheshtala bids due in March 2020
BO	India	Malerkotla STP	22,000m³/d sewage treatment plant	Three bids under evaluation
BO	India	Multiple STPs, Gujarat	128,250m³/d of STP capacity	Veraval bids due in March 2020
BO	India	Munger STP	30,000m³/d sewage treatment plant	Four bids under evaluation
BO	India	Naidupet and Atchutapuram CETPs	4,000m³/d of capacity across three CETPs	Tender expected later in 2020
BO	India	New Chandrapur town STP	24,000m³/d sewage treatment plant	Contract awarded
BO	India	Nilothi tertiary polishing unit	68,190m³/d tertiary polishing unit	Bids due in February 2020
BO	India	Noida STPs	180,000m³/d of sewage treatment capacity	Bids due in March 2020
BO	India	Panki Thermal Power reuse	40,000m³/d UF/RO plant	Contract awarded
BO	India	Raikot STP	7,000m³/d sewage treatment plant	Bids due in February 2020
BO	India	Rajivnagar recycling plant	60,000m³/d recycling plant for industrial reuse	Bids due in February 2020
BO	India	Ramnagar STPs	8,500m³/d of sewage treatment capacity	Contract awarded
BOF	India	Songadh STP	4,500m³/d STP for industrial reuse	Bids due in February 2020
BO	India	Tirupati STP	25,000m³/d sewage treatment plant	Bids due in February 2020
BO	India	Vapi STP	29,530m³/d sewage treatment plant	Bids due in February 2020
BO	India	Worli WWTP	500,000m³/d WWTP	Bids due in February 2020
BOF	India	Yamunanagar TTP	20,000-25,000m³/d tertiary treatment plant	Consultancy bids due in March 2020
B	Indonesia	Makassar WWTP	New 16,000m³/d WWTP	Bids due in March 2020

Type	Country	Project name	Description	Status
B F	Iran	Abarkooh WWTP	7,139m³/d WWTP	SoQs due in March 2020
B O F	Iran	Asad Abad STP	New wastewater treatment plant	SoQs due in February 2020
B O F	Iran	Bojnourd STP	44,000m³/d wastewater treatment plant	SoQs due in March 2020
B O F	Kuwait	Umm Al-Hayman WWTP	500,000m³/d WWTP	Financial close achieved
B O	Morocco	Taourirt industrial zone WWTP	1,500m³/d wastewater treatment plant	Bids due in February 2020
B	Namibia	Gammams DPR plant	25,000m³/d direct potable reuse facility	Consultancy tenders underway
B O F	Peru	Cajamarca WWTP	Wastewater treatment plant	Conceptual stage
B O F	Peru	Cañete WWTP, Lima	Wastewater treatment infrastructure	Conceptual stage
B O F	Peru	Chincha WWTP, Ica	Three wastewater treatment plants	Conceptual stage
B O F	Peru	Cusco WWTP, Cusco	Expansion of wastewater treatment plant	Conceptual stage
B O F	Peru	Huancayo WWTP	80,700m³/d WWTP	Conceptual stage
B O F	Peru	Huaraz WWTP, Áncash	Wastewater treatment plant	Conceptual stage
B O F	Peru	Huaura WWTP	WWTP for Huaura province	No private proposals received
B O F	Peru	Puerto Maldonado WWTP	New wastewater treatment plant	Tender expected in Q2 2020
B O F	Peru	Tarapoto WWTP, San Martín	Wastewater treatment plant	Conceptual stage
B O F	Peru	Trujillo WWTP, La Libertad	Three wastewater treatment plants	Conceptual stage
B O F	Qatar	Al-Wakra & Al-Wukair STP	150,000m³/d sewage treatment plant	Bids due in March 2020
B O F	Saudi Arabia	Buraidah 2 ISTP	150,000m³/d sewage treatment plant	RFQ issued
B O F	Saudi Arabia	Dammam West ISTP	New 200,000m³/d tertiary WWTP	Financial close imminent
B O F	Saudi Arabia	Medina 3 ISTP	375,000m³/d sewage treatment plant	62 EoIs received
B O F	Saudi Arabia	Tabuk 2 ISTP	90,000m³/d sewage treatment plant	RFQ issued
B O	Singapore	Tuas WRP	800,000m³/d WWTP complex	Domestic liquids bids due in March 2020
B	Spain	Alcoi WWTP, Alicante	Tertiary upgrade at 23,976m³/d WWTP	Bids under evaluation
O	Spain	Aljarafe WWTPs O&M, Seville	O&M of wastewater treatment plants	Re-tender awaited
O	Spain	Baix Ebre WWTPs (O&M)	O&M of wastewater treatment plants	Award pending
O	Spain	Caceres, Extremadura	O&M of wastewater treatment plants	Bids due in February 2020
B	Spain	Cheste-Chiva WWTP, Alicante	16,000m³/d WWTP	Fifteen bids under evaluation
O	Spain	Costa Brava WWTPs, Catalunya	O&M of wastewater treatment plants	Bids due in February 2020
B O	Spain	Muskiz WWTP	Expansion of existing WWTP	Three bidders shortlisted
O	Spain	Pinedo WWTP, Valencia	O&M of 324,800m³/d of wastewater treatment capacity	Contract awarded
O	Spain	Sur WWTP, Madrid	O&M of wastewater treatment plant	Bids due in March 2020
B	Sweden	Vappa WWTP	New 45,000 PE WWTP	Permit expected by June 2020
B	Switzerland	Gland-Nyon regional WWTP	New WWTP with micropollutant removal	Feasibility study due to start in Q1 2020
B	Switzerland	SIGE regional WWTP	New WWTP with micropollutant removal	Decision on location expected by end of 2020
B	Tunisia	Kasserine and Nefta WWTPs	Rehab and expansion of two WWTPs	Ten SoQs under evaluation
B	Tunisia	Moknine 2	5,000m³/d industrial effluent treatment plant	Contract award expected in July 2020
O	Tunisia	WWTP O&M contracts	O&M of wastewater infrastructure	Bids due in February 2020
B	Turkey	Sorgun WWTP	9,100m³/d WWTP	Mandatory meeting in February 2020
B O F	United States	Ascension Parish wastewater, LA	Centralised wastewater system	Parish approval awaited
B	United States	Brushy Creek WWTP expansion, TX	10MGD WWTP expansion	Construction bids now due in February 2020

Type	Country	Project name	Description	Status
B	United States	Coronado golf course recycling plant, CA	Satellite water recycling facility	Conceptual stage
B	United States	Denver Water expansion, CO	56,775m³/d expansion of reuse capacity	Long-term project
B	United States	East County Advanced Water, CA	43,528m³/d advanced water treatment plant	SoQs for conveyance contract due in Mar 2020
B	United States	Hampton Roads ASR project, VA	454,200m³/d of treatment capacity for ASR	SoQs due in March 2020
B	United States	Inland Empire RP-5 expansion, CA	113,550m³/d MBR system	Construction bids due in March 2020
B	United States	JEA potable reuse, FL	Up to 151,400m³/d of potable reuse	Equipment contracts for demo pending
B	United States	LA Advanced Water Purification Facility, CA	94,625m³/d advanced treatment plant	SoQs due in March 2020
B O F	United States	Lake Oswego WWTP, OR	New wastewater treatment plant	Three groups shortlisted
B	United States	Pure Water Monterey expansion, CA	Expansion of advanced water treatment plant	Draft supplemental EIR released
B	United States	Pure Water Oceanside, CA	Phased 22,710m³/d reuse project	Contract awarded
B	United States	Pure Water Project Las Virgenes-Triunfo, CA	22,710m³/d advanced water treatment plant	Demo plant under construction
B	United States	Pure Water Soquel, CA	1.34MGD (5,072m³/d) AWPF	Conveyance contract awarded
B	United States	South Laredo potable reuse (Phase I), TX	Upgrade of 45,420m³/d WWTP	Feasibility study consultant selected
B	United States	Stowe Regional WRRF, NC	New regional WWTP	DB team selected
B O F	United States	Unified South Sarpy Wastewater System, NE	Phased wastewater infrastructure build-out	RFQ likely in H1 2020
B	United States	West Basin IPR/DPR, CA	Recycled water master plan	Recycled water master plan under development
B O F	Vietnam	West Saigon WWTP	150,000m³/d WWTP	Consultancy bids under evaluation

The 2020 Global Water Awards Shortlisted entries

GLOBAL WATER AWARDS 2020

Celebrating the world's most exciting water achievements

GWI presents the list of companies and projects which have been shortlisted for this year's Global Water Awards.

This month, GWI is proud to announce the shortlisted entries for the 2020 Global Water Awards. Online voting will open on 24 February, and the awards themselves will be presented at a dedicated ceremony to be held at the spectacular La Quinta de Jarama estate In Madrid, Spain, on 30 March, as part of the 2020 Global Water Summit.

WATER COMPANY OF THE YEAR

For the water company that made the most significant contribution to the development of the international water sector in 2019.

CULLIGAN

What is it?
A private equity-owned water filtration, softening and disinfection specialist, active globally in the residential, office, commercial, and industrial water treatment markets.

What has it done?
Culligan positioned itself at the cutting edge of the global point-of-use water treatment market by maintaining a razor-sharp focus on maximising the customer experience. In targeting above-market growth through a dedicated commitment to organic and acquisitive growth, it has fully embraced digital sales channels without compromising its established dealer network.

What makes it special?
- Culligan is one of the most seasoned players in the water M&A game, bolting on local dealerships and advanced tech companies alike, with a rhythm and a ▶

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discipline that few can match. The result: a dealer network that is second to none, and a broad portfolio of complementary products wrapped up in a first-class service offering. Its biggest deal yet – the $1.1 billion acquisition of AquaVenture, negotiated in 2019 – is a true game-changer, taking it deeper into the rapidly growing bottleless water cooler segment.

- By intelligently capturing the market zeitgeist and building a commercial offering around it, Culligan has become the go-to provider of products and services which deliver the best possible point-of-use experience for the customer – wherever they are. Its traditional filtration and softening solutions are complemented by the ability to deliver chilled, boiling and sparkling water from a single stylish tap – thus helping to reduce single-use plastics.

- Culligan invested heavily in digital technology in 2019 as part of a drive to enhance its service offering by linking water quality data, consumption trends, and filter replacement schedules on a single platform. It is hard evidence that the Culligan Man has grasped an increasingly connected future with both hands.

ESSENTIAL UTILITIES, INC.

What is it?
A NYSE-listed investor-owned water and wastewater utility serving 3 million people within a multi-state envelope across the United States. Formerly known as Aqua America.

What has it done?
The company positioned itself at the forefront of its peer group in terms of geographical exposure, forward-thinking regulatory engagement, and profitable growth. Its bold diversification into the natural gas distribution market will take it into a new dimension.

What makes it special?

- A series of calculated growth initiatives and prudent portfolio management have enabled Essential Utilities to establish itself as the most favourably positioned US investor-owned water utility from a regulatory standpoint. An unswerving willingness to engage proactively with state public utility commissions on regulatory matters has seen it lead the pack in terms of improving service for millions of US ratepayers.

- After scouting around for transformative growth opportunities in water, the management team at the former Aqua America made the groundbreaking decision to diversify into natural gas through the $4.3 billion acquisition of Peoples Gas. Their disarmingly simple argument to mollify the purists was that digging up a road to put in a water pipe is exactly the same as digging up a road to put in a gas pipe.

- Despite a dilutive share issue in April 2019, Essential's share price rose by more than a third over the course of last year as the company delivered time and again on its growth objectives. Its focus on proactively creating opportunities which benefit not just its own book, but the whole industry, has propelled it to stand head and shoulders above its peers. A true pioneer.

Culligan positioned itself at the cutting edge of the global point-of-use water treatment market in 2019

H2O INNOVATION

What is it?
A TSX-listed provider of water treatment systems, specialty products, and O&M services.

What has it done?
2019 was little short of an annus mirabilis for H2O Innovation. The company recorded record revenues, completed its biggest ever acquisition, and commissioned its largest membrane bioreactor plant to date, all while doubling down on bringing its unique value proposition to bear for an increasingly global customer base.

What makes it special?

- H2O Innovation's tailored M&A strategy reached new highs in 2019 with the acquisition of Genesys – its largest deal to date. The transaction means that H2O now boasts one of the biggest distribution networks for specialty chemicals in the world, marking a turning point in the group's ability to deliver a broad array of mem- ▶

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brane chemical solutions.

● 2019 was the year that H2O's rapidly growing Piedmont couplings and filter housings business really showed the global desalination market what it is capable of. The highlight on a long list of contract wins was the deal to supply filter housings to the 900,000m³/d facility at Taweelah in the UAE – set to be the largest membrane desalination plant in the world.

● The genius of H2O Innovation's dynamic leadership team has been to encourage the three pillars of the business to work in harmony to deliver a uniquely tailored value proposition. No company, large or small, did more last year to earn the respect of its competitors and its clients.

KURITA WATER INDUSTRIES

What is it?
A $2.5 billion-a-year Tokyo-listed supplier of water treatment chemicals and treatment systems.

What has it done?
Kurita celebrated its 70th anniversary in 2019 by showing the world that it has never been more serious about going global. Its structured acquisitions programme gained momentum with the purchase of U.S. Water Services and Avista Chemicals, it appointed a local company veteran as its new CEO in Europe, and even delivered a water recycling system for testing on the International Space Station.

What makes it special?
● Many Asia-domiciled water companies have made bold claims about conquering the global market. Kurita has made it a reality. Last year, it consolidated its growing footprint in the US by buying industrial treatment solutions provider U.S. Water Services, and broadened its offering in reverse osmosis chemicals by snapping up Avista Technologies, taking it further into Europe and the Middle East.

● Kurita underscored its commitment to the digital water market in 2019 by leading an $11 million funding round in US-based intelligent water management specialist Apana, while U.S. Water launched the Lumyn digital platform for proactive water system management. Its internal product development engine was also functioning at full throttle, as Kurita Japan rolled out its Dropwise condensation technology, which improves heat transfer efficiency in heat exchangers.

● As a supplier of bespoke treatment systems, Kurita has set its sights far beyond mere land-based applications, supplying a water recycling demonstration system to the Japan Aerospace Exploration Agency in 2019, for use on the International Space Station. It uses ion exchange, electrolysis and electrodialysis to turn astronauts' urine into potable water, weighs 75% less than conventional systems, and uses half the power. One giant leap towards the future of manned space flight.

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DESALINATION COMPANY OF THE YEAR

For the company which made the greatest overall contribution to the desalination industry in 2020.

ABENGOA

What is it?
The water branch of the global engineering giant, which has a installed desalination capacity in excess of 1.7 million m³/d, including some of the world's most high-profile plants.

What has it done?
In a difficult market for contractors, Abengoa established a reputation over 2019 as simply the best in the business when it came to securing mega-projects and delivering even the largest and most complex undertakings on (or before) time.

What makes it special?
● As it moved to the top of the desal constructor lists by capacity contracted, 2019 was without a doubt the most successful year ever for Abengoa in terms of winning the world's most important desalination contracts. From the world's biggest-ever membrane desal plant at Taweelah in the UAE to the Rabigh mega-plant in Saudi Arabia to many others, the company's order book was stuffed to bursting last year. The completion of projects already under way will mean its already impressive reference base more than doubling to a gobsmacking 3.7 million m³/d when work is complete.

● The company cemented its reputation in 2019 for not only winning huge desalination contracts, but delivering them. Alongside partner Fisia, Abengoa delivered the 250,000m³/d Shoaiba 3 Expansion 2 project in Saudi Arabia flawlessly and well ahead of schedule, helping to kick off the wave of desal building that is currently flowing out of the Kingdom.

● The company's confidence and insight into the details of solar power complement its desalination expertise at a time when water and renewable energy are marching together hand-in-hand. As cheap solar energy promises to rewrite the rules on desalination pricing, Abengoa became a driving force in the launch of the EU-backed Scarabeus project that aims to itself rewrite the rules of pricing on concentrated solar thermal technology. ▶

Kurita spent its 70th anniversary year on a dazzling acquisition spree

ACWA Power's work developing the second expansion to the Shoaiba 3 plant it owns marked the start of a renewed period of dominance in desalination PPPs

ACWA POWER

What is it?

A Saudi Arabian water and power project developer, investor, owner and operator. The company has interests in a portfolio of 56 assets in 11 countries, including desalination plants with a combined generation capacity of 5.3 million m^3/d.

What has it done?

As well as cementing its role as perhaps the world's leading desalination project developer in 2019 with a string of giant contract wins, ACWA Power's technological skill, canny incorporation of renewable energy and financial acumen helped push the price of water from desal down to new lows. ACWA Power's growing strength in water has been synonymous with the development of the international desalination market, and no company has done more to redefine the fundamentals of the industry.

What makes it special?

- ACWA Power's unique portfolio and its mastery of the intricacies of renewable energy helped it win water projects in 2019 and rewrite the rules on pricing for the industry. The success of the audacious bid for the Taweelah IWP in Abu Dhabi showed that desalinated water for under $0.50 a cubic metre is the new benchmark for the industry.
- The company demonstrated a superlative ability to combine of finance and engineering in 2019, achieving lightning-quick financial close on three of the world's largest-ever desalination projects. The fast-closing ACWA-led deals at Rabigh, Umm al Quwain and Taweelah saw nearly $2.5 billion of private capital invested into desalination, showing a company that can by itself drive the fundamentals of the desal market.
- The successful commissioning of the second expansion to the Shoaiba 3 desalination plant marked the first time in Saudi Arabia that a private developer had taken full ownership of a major asset with no state involvement. It was a bold sign of confidence in PPP as it plays a crucial role in the country's national strategy.

AQUATECH

What is it?

An engineer, contractor and operator specialising in water purification technology for industrial and infrastructure markets, headquartered in the US, and focusing on desalination, water recycling and zero liquid discharge projects.

What has it done?

The company wielded its unique industrial desalination expertise to great success in 2019, demonstrating its global reach with a series of high-profile developments. At the same time its municipal business made a stunning breakthrough in the company founder's home country of India, where it will be rolling out a generation of desal plants aimed at drought-proofing the water-scarce state of Gujarat for years to come.

What makes it special?

- Aquatech made one of its biggest municipal desalination breakthroughs at the end of the year, securing contracts alongside Indian EPC Shapoorji Pallonji to develop four desalination plants in Gujarat with a combined capacity of At a time when India is rapidly becoming one of the world's growth engines for seawater desalination building, Aquatech is perfectly positioned to meet that growth and make a difference for some of the world's most water scarce regions.
- Aside from their scale and local importance, the Gujarat contracts stand out as one of the most significant privately financed contracts ever pushed out by ▶

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Tecton founder and managing director S Lakshmann found fortune for the company taking it back to his home territory of India

Aquatech, showing a company that is willing to back its finely honed engineering chops with financial muscle.

- The company continued to demonstrate its reputation as top of the class for industrial desalination with the completion of the Lower Fars Oilfield wastewater recycling facility for the Kuwait Oil Company. Deploying a vast array of membrane technologies to turn treated municipal effluent into high-quality water for steam injection, the plant is a reminder of the importance water treatment plays in keeping industries running.

TECTON ENGINEERING

What is it?
A multi-disciplinary EPC company headquartered in the United Arab Emirates. It specialises in major turnkey projects covering medium and higher-capacity seawater desalination plants, water transmission pipelines, sewage treatment plants and other related infrastructure projects.

What has it done?
In 2019 Tecton made a stunning leap into the top five desalination contractors in the 32nd Worldwide Desalting Plant Inventory collated by GWI and the IDA after a string of high-profile contract wins over the previous year. Its links with India paid off as it snapped up orders worth $400 million there, showing that despite its headquarters in the UAE, the Middle East does not have to be the be all and end all of the desal industry.

What makes it special?
- A combination of international contracting experience perfected in tough Middle Eastern conditions and the legacy of its Indian founders helped the company secure the country's most significant seawater desalination reference for years in the shape of the 150,000m³/d Nemmeli II desalination plant in Chennai alongside Tedagua.

- India's buoyant market for desalination has made the country a happy hunting ground for companies with the chops to establish long-term links and strong partnerships there. Tecton's success at Chennai was matched with a similar success securing the 100,000m³/d Dahej contract alongside Larsen & Toubro.

- The successes in India perfectly position the company for a long-planned pivot into new areas of contracting and new markets away from its Gulf home. As desalination opportunities in the Middle East grow thinner for contractors in a crowded market, the company is boldly pursuing new markets around the world for both desalination and wastewater treatment.

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WATER TECHNOLOGY COMPANY OF THE YEAR

For the company which made the most significant contribution to the field of water and digital technology in 2019.

KAMSTRUP

What is it?
A Danish metering specialist in the field of water and electricity.

What has it done?
Kamstrup emphatically arrived to water's digital revolution in 2019, introducing a cutting-edge water meter with in-built acoustic leak detection, which has seen swift uptake by the European market, as well as expanding its digital capabilities through canny acquisitions. ▶

Kamstrup's smart meters with in-built acoustic leak detection helped enable the data-driven water revolution

Nijhuis found new uses for industrial treatment technologies that saw its capabilities soar over the course of the year

What makes it special?

● Kamstrup's new smart water meter has dramatically raised the bar for intelligent water metering solutions, its in-built acoustic leak detection capabilities helping reduce leaks in service connections, a traditional blind spot for utilities. In one test, 17 leaks were found in an area where 50 meters were installed, reducing water loss from 1.7m³/hr to 0.3m³/hr once repaired. Warm market reception has already resulted in two large projects wins in Denmark as well as dozens of major sales across Europe.

● The Water-link utility in Antwerp, Belgium, is reaping the rewards of Kamstrup's expertise in interoperability between hardware and software as the city implements a roll-out of smart meters to remotely control the supply of water through the network. Kamstrup is playing a pivotal role in integrating its IoT-enabled water meters with valves supplied by a third party – with 74,000 meters already installed throughout 2019 and a further 100,000 in the pipeline, Water-link will have full control over its water network.

● Kamstrup has put itself at the forefront of the digitalisation of the water sector, investing over 13% of turnover in R&D, hiring a dedicated director for software development and obtaining expertise beyond water networks through the acquisition of treatment plant control system specialist Blue Control.

NIJHUIS INDUSTRIES

What is it?

An industrial wastewater specialist with more than a century of history that has evolved into one of the premier water technology companies around today.

What has it done?

Nijhuis saw its revenues soar towards the €100 million mark as its technology development prowess paid off magnificently in 2019. Two thirds of the year's order book contained innovations introduced to the market in the last three years and it drastically expanded its footprint beyond the food processing market to land orders in pharmaceutical, municipal and leisure water reuse.

What makes it special?

● New technologies in the fields of ammonia recovery, fat recovery, intelligent chemical dosing and sludge dewatering have enabled Nijhuis to rapidly expand business previously focused on wastewater treatment for slaughterhouses. The benefits of these technologies can be quickly felt by clients, with Nijhuis' ingenious modular solutions strategy enabling rapid plant start-up times in tiny footprints for demanding industrial customers, as well as boosting its growing mobile water treatment expertise.

● The acquisition of cooling tower equipment repair expert Deba UK complements Nijhuis' existing chemical-free legionella control business, bringing a new dimension to the fight with chemical-based cooling water systems through provision of a consulting-based approach to clients.

● Nijhuis continues to demonstrate an unwavering commitment to resource recovery, showcasing at the 2019 Aquatech water show its pioneering system for turning urine into fresh water and fertilising nutrients, as well as landing a key role in the development of a water refinery plant in the Netherlands, recovering cellulose, organics, phosphorus and nitrogen with its broad suite of advanced technologies.

ROYAL HASKONINGDHV

What is it?

A Netherlands-based international engineering consultancy firm with a highly innovative water technology and software development arm.

What has it done?

In 2019 Royal HaskoningDHV took giant strides in the transition to the circular economy as it blazed the trail for ▶

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Royal HaskoningDHV's testbed at the Utrecht WWTP acted as a launchpad for its innovations around the world

resource recovery. It initiated the first large-scale production unit for its ground-breaking biopolymer product Kaumera Nereda Gum, while the firm scored impressive results with a new sludge digestion technology and its Aquasuite software.

What makes it special?

- The Kaumera bio-based raw material extracted from Nereda sludge is a huge step forward towards creating the truly circular economy, offering a viable and versatile alternative to oil-based materials. Its ability to both absorb or repel water gives Kaumera Gum a variety of applications in the agriculture, building, textile and paper industries; with a second production unit planned to be online in spring 2020, Kaumera looks set for a lasting impact.

- After dramatically shaking up the wastewater treatment space with the Nereda technology, RHDHV has set its sights on anaerobic sludge digestion with a clever new digester configuration. The Ephyra system separates various stages of the digestion process, allowing shorter retention times and increasing biogas production by 75% at the Tollebeek WWTP, which is now energy self-sufficient.

- Royal HaskoningDHV scored a major breakthrough for its Aquasuite AI software platform as a pilot at Singapore PUB's Ulu Pandan Water Reclamation Plant saw increased effluent quality despite aeration flow being reduced by 15%, demonstrating machine learning's key role in meeting increased demands on wastewater treatment.

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SUEZ ADVANCED SOLUTIONS

What is it?

The smart water services business (formerly Aqualogy) of Suez, which is responsible for the Aquadvanced suite of digital monitoring and control solutions.

What has it done?

In 2019 Suez Advanced Solutions was one of the most dynamic engines of growth for the overall Suez portfolio as it took its market-leading Aquadvanced suite of real-time software solutions to new territories. The firm continued to set the pace for the digital revolution by integrating the latest technologies and developing highly impactful external partnerships.

What makes it special?

- In 2019 dozens of utilities across the globe enjoyed Suez's Aquadvanced solutions including Singapore's Public Utilities Board, and Melbourne Water, enabling major cities at the sharp end of today's water challenges to effortlessly monitor their water and sewerage networks in real-time and cut energy costs by making best use of off-peak power rates. The service goes from strength to strength as Aquadvanced Plant is launched in 2020 after extensive full-scale piloting.

- No company was more committed to water's digital future in 2019, as Suez Advanced Solutions struck canny partnerships to not only enhance its range of solutions, such as applying machine learning for pipe assessment with start-up Fracta, but also accelerate high-potential digital projects with other partners through its unrivalled Digital Hub collaborative platform.

- Suez now operates more than 5 million smart water meters across the world ▶

Suez Advanced Solutions' array of digital technologies were taken up by forward-thinking utilities all over the planet

Kando CEO Ari Goldfarb saw his real-time wastewater network monitoring company take the world by storm in 2019

through its hugely successful ON'connect platform, which leverages the Internet of Things to help cities and their inhabitants become much more sustainable in their water use.

BREAKTHROUGH TECHNOLOGY COMPANY OF THE YEAR

For the early-stage technology company which made the most impressive commercial breakthrough into the global water technology market in 2019.

KANDO

What is it?
An Israeli start-up combining real-time wastewater network monitoring with big data analytics to give utilities the insight they need to optimise their services, minimising environmental damage and maximising reuse potential.

What has it done?
After dominating its domestic market, offering wastewater monitoring and data analytics services in every major Israeli city, 2019 saw Kando take the global market by storm, securing new clients in the US, Europe and Australia. After securing a major new investment last year, the firm is now positioned to launch a raft of new products and services in 2020, helping utilities all over the world meet regulatory requirements and secure the environment for generations to come.

What makes it special?

- The company's live alerts and predictive impact assessments paid off in a big way for major clients in 2019. In the industrial centre of Haifa, network operators saw a $1 million drop in treatment costs and a 75% reduction in waste spills in the year after adopting Kando's system. In Jerusalem, operators reported a 40% reduction of pollution events in the industrial zones where the solution has been deployed, resulting in a 10% fall in treatment and operation costs over the course of the year.

- After working with clients to establish their service requirements, Kando use data-driven modelling to identify exactly where IoT monitoring units should be deployed for maximum effect, a digitally collaborative model that is truly on the cutting edge of improvements of water performance for a new decade.

- Kando's units deliver live condition reporting from inside client networks, enabling the firm's cloud-based analytics engine to alert users to contamination events in real-time. Every data packet transmitted to Kando's secure server is geologically defined, allowing users to pinpoint dischargers responsible for contamination events. With this insight, utilities can better enforce regulations, minimising pollution and reducing environmental damage.

KETOS

What is it?
A digital technology provider from California that is aiming to improve treatment plant operations by delivering cloud-based, unmanned water quality monitoring systems to utilities.

What has it done?
In 2019, Ketos successfully broke through, securing a major pilot project in association with the Southern Nevada Water Authority, providing the utility with rapid source quality readings to tailor its treatment plant operations. In California, Castle Rock State Park also selected the technology in order to become the first U.S. state park to continuously monitor drinking water quality.

Why is it special?

- As its upward trajectory accelerated in 2019, February saw Ketos raise an impressive $9 million of Series A funding, allowing the company to expand its team around an accomplished CEO; while the opening of an office in India marks a massive step in the company's aim to address global water management issues.

- The company's holistic approach measures over 20 water quality parameters, including heavy metal ions, inorganics, and nutrients. This is providing users with a comprehensive web of information that can be used for real time monitoring and future modelling, allowing them to transform their operations.

- Ketos' new Shield Fabric digital solution combines multiple testing elements into a single system, streamlining the monitoring process. Utilities can also benefit from a reduction in manual water testing costs, can be prohibitively expensive. ▶

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Oxymem's patented membrane aerated biofilm reactor systems proved so popular they attracted the eye of a major investor

MAGNA IMPERIO SYSTEMS

What is it?

An electrochemical desalination specialist which has developed an innovative high recovery desalination system using the principles of electrodialysis reversal.

What has it done?

Magna Imperio brought the benefits of its high recovery, low energy technology to a vast spectrum of new customers in 2019, reinforcing the virtues of electrochemical desalination among the industry. Expanding to applications beyond brackish water desalination and the securing of $15 million of funding helped MI Systems multiply its revenues and set it firmly in place to become a major market player.

What makes it special?

- The company's versatile Electrochemical Nano Diffusion (END) technology proved itself as a robust alternative to electrodialysis reversal in 2019 through its lower energy consumption, landing a string of contracts in the food & beverage industry as well as municipal wastewater and potable water treatment applications, where it is achieving recovery rates between 95 and 98 percent, enabling customers to cut their water costs and consumption.

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- In early 2019 the company installed a system for the Saint Arnold Brewing company, which now boasts a 98% water recovery rate, increasing from 65% previously. The return on investment for the system is on track to be an impressive 14 months, proving beyond a doubt the inherent value of the technology.

- A two-week pilot of the END process in Ventura County, California helped a wastewater treatment plant meet chlorides and dissolved solids discharge limits with 96% water recovery, enabling safe addition of another 150 acre-feet of water per year for groundwater recharge. The pilot resulted in an immediate commercial sale, setting the template for the company's future success.

OXYMEM

What is it?

A wastewater treatment technology company spun out of University College Dublin in 2013, that produces a patented membrane aerated biofilm reactor (MABR) technology.

What has it done?

Oxymem's activities reached a climax in 2019. While the company prepared to install the UK's largest membrane aerated biofilm reactor, and Spain's first new build MABR integration with activated sludge, in December it was snapped up by the soaraway Dupont. As a recognition of the company's skills it is a huge vote of confidence; as a chance to further upscale its capabilities to keep up with market demand, the move is truly transformative.

What makes it special?

- As utilities are continually pushed for ever lower nutrient discharge levels, the drivers for MABR technologies are stronger than ever. In 2019, the MABR modules were tested as part of a high profile pilot by VCS Denmark, in order to approach the problems faced by the water industry from a different angle. Oxymem's solutions impress customers with the option of a drop-in system, a vital part of business in an industry where every second of uptime counts. This attractive feature enables utilities to pilot the technology and choose commercial installations with less risk.

- The company experienced huge levels of interest from the industry, and significantly expanded its operations and revenues throughout 2019. The culmination of the acquisition by Dupont signifies the multinational's confidence in MABR solutions, proving them to be a significant technology that is worth investing in for the future.

- The solution has the potential to provide benefits for both the municipal and industrial realm. A wide range of end-users are accepting MABRs as a revolutionary technology, including Saudi Aramco, which has approved Oxymem's products for use on its sites across the country, a critical success in one of the world's largest strategic water infrastructure markets. ▶

PUBLIC WATER AGENCY OF THE YEAR

For the governmental agency or public body that made the biggest difference to water and wastewater service provision and utility management in 2019.

AIR SELANGOR, MALAYSIA

What is it?

A special purpose vehicle ultimately owned by the Selangor state government's investment arm MBI. It was set up in 2007 to be the single provider of water services in Selangor and the Federal Territories of Kuala Lumpur and Putrajaya following a restructuring of the water sector. It currently supplies around 8.6 million people.

What has it done?

Twelve years after it was founded, Air Selangor finally achieved its founding goal in 2019 by taking full control of the state's water supply. As it took on the mantle of sole provider, it demonstrated amply why this situation was deemed important by making major breakthroughs in the improvement of services for its millions of customers.

What makes it special?

- 2019 marked the culmination of more than a decade of planning to bring Air Selangor to full control of the region's water supply. The acquisition of the state's last remaining concessionaire in April reversed decades of fragmentation and placed the organisation in position to wield economies of scale and bring its service excellence to every single resident in the area.

- The group pioneered a new approach to "free water" in 2019. By refocusing subsidies on lower-income households, it secured a more stable financial base without compromising water supplies where they are needed most. With high-end new water infrastructure such as the 200,000m³/d Labohan Dagang water treatment plant coming online throughout the year, water provision in Selangor has been completely transformed for residents.

- The organisation made a stunning breakthrough in 2019 tackling the perennial problem of non-revenue water. Through the mass adoption of pipeline sensors and the replacement of more than 300,000 damaged and old meters, the group significantly exceeded its targeted figure and brough NRW down to a record low of 28.73%, saving an estimated 65 million litres a day of water.

GUJARAT WATER INFRASTRUCTURE, LTD, INDIA

What is it?

A state-owned body created to ensure bulk water supply through the establishment of new infrastructure in the arid state of Gujarat, India.

What has it done?

Gujarat joined Tamil Nadu as the hub of Indian desalination development in 2019, thanks largely to the efforts of Gujarat Water Infrastructure Ltd. (GWIL). As India developed into one of the quickest-growing markets for desal around, the financial confidence and careful contracting and collaboration shown by GWIL made desal pay off in ways that would not have been though possible, a huge boon for one of the world's most drought-affected regions.

What makes it special?

- The awarding by GWIL of four major desalination contracts with a combined capacity of 270,000m³/d around Gujarat to an Aquatech/Shapoorji Pallonji team showed that municipal desalination can make a difference in India, and gives the country a new string to its bow when it comes to dealing with the ongoing drought conditions savaging part of the country.

- With the four desalination projects to be rolled out under the private finance-supported Hybrid Annuity Model, the deals showed that major infrastructure need not mean a major capital burden on the public purse in India. It brought new investors into the Indian infrastructure market and positions the country's sector well for further PPP development at a crucial time for the country's water infrastructure.

- The Gujarat projects were issued to the market and finalised over the course of 2019 – one of the quickest ever procurement processes for projects of these type and scale, and a stunning breakthrough for contracting in a traditionally torpid project market. It is a hugely positive sign for the numerous future projects set to be rolled out to address water shortages.

Malaysia's Air Selangor tackled state-wide consolidation, leakage management and tariff reorganisation – all at the same time

MEKOROT, ISRAEL

What is it?

Israel's national water company, founded in 1937 and today responsible for bulk supply and management of resources across the country, as well as water supply to neighbouring areas under international agreements.

What has it done?

Last year saw Mekorot demonstrate its unique brand of excellence at both the macro and micro levels of water infra- ▶

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Saudi Arabia's National Water Company made the most of its expanded remit to push excellence at every level

structure. As it pushed through with colossal infrastructure projects such as the plan to link desalination plants to top up the Sea of Galilee, it helped nurture and deploy an array of new technologies that could define the water sector for decades to come.

What makes it special?

- Israel's already-enviable position as the leading light in combining water with the best of high technology was strengthened further in 2019 by Mekorot as it introduced the best of the world's water technology across the network. From optical fibres to monitor process systems to the rollout of internet-of-things enabled metering systems to the creation of a unique data-drive management system, the company was ready to deploy the best solutions available at every turn.

- Solidifying its reputation as an developer as well as a customer of technological excellence, the company launched its WaTech hub in late 2019 to incubate new technologies and widen Mekorot support and investment in the best the "start-up nation" has to offer. Meanwhile it advanced groundbreaking internally developed tech systems like Meklock – enabling access control to remote sites and saving up to €1 million a year in manual field work costs.

- Access to finance is always a tricky issue in water, and Mekorot showed a willingness to explore new areas to support its ambitious goals. Its first-ever public bond issue was three times oversubscribed and ended up raising $280 million, a huge vote of confidence in the body's work and skills.

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NATIONAL WATER COMPANY, SAUDI ARABIA

What is it?

The state-owned national water and wastewater services utility, responsible for the supply of potable water and collection and treatment of wastewater for more than 33 million people across the Kingdom.

What has it done?

The NWC's remit was expanded from major cities to cover the entire country in 2018, at a stroke making it perhaps the world's largest utility. In the time since, the body has flawlessly incorporated the new areas into its portfolio, while transforming its operations and service levels – and laying the way for even more radical and exciting changes in the years to come.

What makes it special?

- The colossal bureaucratic challenge of folding rural and outlying areas with disparate needs into the NWC's cutting-edge urban service quality levels was met in 2019 by the company's groundbreaking Hayat digital customer care and billing programme. Successfully completed in an ambitious nine-month timeline, the system merged six legacy systems and 55 million-plus records to a unified system that enhanced customer experiences while transforming the utility's reaction times.

- In 2019 the NWC put the final touches to a aggressive smart metering programme that has driven the utility's transformation strategy. Over 2019 a new smart meter was installed every minute on average, cutting the utility's meter reading costs by 75% and creating a wealth of data that allowed it to smash improvement targets – non-revenue water levels were reduced by 3.4% over the course of 2019 alone.

- Last year saw the start of procurement for the NWC's regional "management, operation and maintenance" contracts, under which the private sector will be invited to support and improve utility services in a way and scope never before seen in the region. Rigorous planning and thinking outside the box meant the NWC and its advisors are now finally positioned to allow private sector expertise to pay off for tens of millions of people in the Kingdom.

DESALINATION PLANT OF THE YEAR

For the desalination plant, commissioned in 2019, that represents the most impressive technical or ecologically sustainable achievement in the industry.

EL ALAMEIN, EGYPT

What is it?

A €110 million seawater desalination plant with a capacity of 150,000m³/d designed to serve a population of one million people at the New Alamein City in Egypt.

Who is involved?

The project was financed by the Egyptian government and delivered by lead EPC contractor FCC Aqualia, with constructed completed on 1st July 2019. The plant features high-pressure membranes from LG, Sulzer pumps, Energy Recovery, Inc. energy recovery devices, Belgicast valves, and a Siemens control system. The contract included one year of operations and maintenance, also ▶

undertaken by Aqualia.

What makes it special?

- The plant is the joint largest in Egypt, and as the largest desalination plant serving Egypt's northern coast its commissioning represents a pivotal moment for the sustainability of the country's future water security at a time when access to water resources has become a critical matter of national security. As the first desalination plant to be brought online to support Alamein's development it helps to soothe the country's rapidly growing population and urban buildout.

- Located on sandy coastal soil, the project had to overcome challenging construction conditions in order to successfully meet a rigid schedule for fast-track delivery of the desalination plant and associated facilities.

- The project also deploys an environmentally conscious brine disposal system, featuring blending of brine with cleaning water and a 1,400m submerged discharge outlet to achieve better dispersion of salts, in compliance with stringent Egyptian environmental regulations and reducing widespread fears over the impact of brine disposal into the sea.

NEOM DESALINATION PLANT, SAUDI ARABIA

What is it?

A 215,000m³/d seawater reverse osmosis plant built to supply water to Saudi Arabia's planned mega-development NEOM. The plant is a vital stepping stone to fulfilling the role of the "smart city" role in the Kingdom's Saudi Vision 2030 programme.

Who is involved?

The project was delivered on an EPC basis by Metito, whose scope covered civil, marine and electromechanical works delivered over a period of 12 months, including a 4MW solar power installation supplying power to the desalination plant. LG supplied the reverse osmosis membrane for the plant, and Energy Recovery, Inc. supplied energy recovery devices.

What makes it special?

- NEOM's inaugural desalination project was delivered on a breakneck schedule, involving air freight of the majority of large-scale equipment used in the project. The result was the delivery of 50,000m³/d of desalination capacity just five months after award, and the remainder delivered within 12 months, a truly spectacular achievement of contracting skill.

- The project benefited from tight collaboration between Metito and Saudi water sources including the state-owned Saline Water Conversion Corporation, making the plant a truly national project for perhaps the country's most high-profile development of recent decades.

- The 4MW solar power generation system was designed and fabricated in Germany, and forms a crucial part of the plant's cost-saving measures. Metito executed the system in record time, making use of roof space to save the plant footprint for further extensions. The solar power system has an estimated payback period of just five years, proving the case for integration of renewable power into even the most high-profile and high-pressure projects.

The Rancho San Lucas desalination plant proved a marvel of tailored water services

RANCHO SAN LUCAS MULTI-STAGE MULTI-PURPOSE DESALINATION PLANT

What is it?

A 360m³/d seawater desalination unit serving the Rancho San Lucas resort on Mexico's Baja California coast, featuring the first successful field operation of the novel high recovery multi-stage multi-turbo seawater reverse osmosis configuration.

Who is involved?

The Rancho San Lucas MSMT project was a collaborative effort by FEDCO, Water Technologies de México (WTM), Hydranautics, and American Water Chemicals (AWC) for the client, Solmar Resorts. WTM built the skid using turbochargers optimised for high recovery operation with design input from FEDCO to implement the MSMT concept and recommendations from Hydranautics and AWC on membrane and chemical selections.

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The second expansion to the Shoaiba 3 desalination plant proved a model of design excellence while kickstarting the Saudi PPP wave

What makes it special?

- Building upon lessons learned in managing high recovery seawater desalination at the turn of the millennium, the multi-stage multi-turbo desalination unit at Rancho San Lucas demonstrates that seawater recovery can be maximised with high reliability and energy efficiency with low capital and operating costs using standard pretreatment, RO membranes, membrane housings and instrumentation.

- This first installation allowed the hotel operator to achieve required permeate production from limited well capacity. The unit has since racked up over one year of continuous operation without downtime or loss of performance. Built originally as a pilot, the hotel purchased the MSMT to serve as its prime source of potable water in lieu of an existing conventional SWRO system.

- The MSMT is a fully integrated multi-stage desalination solution that uses turbochargers to provide a pressure boost to each stage, achieving balanced membrane flux and flow velocity for optimised performance throughout the membrane array. For Rancho San Lucas, the MSMT achieved 60% recovery and an enviable specific energy consumption. The success of the Rancho San Lucas MSMT has spurred cooperation with DuPont, Hydranautics, and others to usher in the next generation of RO process design based on ultra-high pressure membranes to take recovery to new highs.

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SHOAIBA 3 EXP. 2 IWP, SAUDI ARABIA

What is it?

A 250,000m³/d independently owned SWRO desalination facility, forming part of the Shoaiba 3 power and water complex in Saudi Arabia, and supplying water to meet the needs of more than one million residents in Jeddah, Mecca and Taif.

Who is involved?

The $253 million facility was developed and is owned 100% by ACWA Power, with the Saudi Water Partnership Company (SWPC) acting as the offtaker. Construction was carried out by a joint venture of Abengoa and Fisia Italimpianto and the plant is operated by ACWA subsidiary NOMAC. Equipment was supplied by Toray (high-pressure membranes), Torishima and Sulzer (pumps) and ERI (energy recovery devices).

What makes it special?

- As the first project to be successfully completed under the new wave of water privatisation projects led by SWPC, the plant places a flag for PPP in Saudi Arabia, a crucial success at a time when the kingdom is looking to private finance to achieve its staggeringly ambitious water infrastructure goals. As the first major infrastructure project to be 100% owned by the private sector in the Kingdom, it shows a market that is opening up even as it is increasing the pace of success.

- Despite having to cope with a wide range of hostile operating conditions, careful design work by EPC contractors mean the plant is deftly optimised to balance the highest levels of efficiency while keeping to the stringent capex requirements seen in today's desalination market. An ultra-compact design reduces footprint and unnecessary capital costs, while chemical dosing and post-treatment facilities are fine-tuned to keep the operating burden to a minimum.

- The project was completed just 21 months after the signing of agreements with the client, a truly stunning achievement for a plant of this scale, complexity and importance, and a timeline which sets a standard for ambitious contractors across this industry.

WATER PROJECT OF THE YEAR

For the water project, commissioned during 2019, that shows the greatest innovation in terms of optimising its physical or environmental footprint.

CHOA CHU KANG WATERWORKS UPGRADE, SINGAPORE

What is it?

A mass-scale ceramic membrane upgrade to Singapore's largest water treatment plant. Half of the plant's 362,000m³/d treatment capacity, where polymeric membranes were originally installed in 2008, was upgraded to ceramic ultrafiltration (UF) technology, followed by an ozone-biological activated carbon filtration (BAC) process. ▶

Who is involved?
Jacobs designed the new facility and supervised construction, testing and commissioning. The design features PWNT's CeraMac UF solution using ceramic membranes from Metawater. Ozonation components were provided by Mitsubishi and BAC media by Calgon. Evoqua provided electrolysers for the final electro-chlorination treatment step. Construction was led by local contractors including UGL, UGME, and a joint-venture between Chye Joo Construction and Sanli M&E Engineering.

What makes it special?

- Choa Chu Kang is now the largest ceramic membrane drinking water facility in the world, marking a new level of success for the technology. The cutting-edge material deployed increases the membranes' lifespan to an unrivalled 20 years, making it a superlative economical solution based on the kind of life-cycle cost analysis that is increasingly driving utilities' balance sheets.

- The adoption of ceramic membranes allowed designers to implement continuous, in-line pre-ozonation which cleans the membrane surface as it filters the water. This, in turn, increases the membranes' recovery rate to over 99% and reduces opex by saving on disinfectant downstream.

- The ozone-BAC process following membrane filtration improves the plant's robustness in the face of changing raw water quality. As climate change increases the frequency of algal blooms in Singapore's reservoirs, this strengthened treatment process is crucial to the island-nation's supply resilience at a time when its water resources are coming under increasing strain.

MONTEVINA WTP UPGRADE, USA

What is it?
A complete modernisation of the treatment train at San Jose's 113,500m³/d Montevina water treatment plant. The 50-year-old facility has been retrofitted with seven ultrafiltration (UF) trains and two reverse osmosis (RO) trains for backwash water recycling and increased recovery.

Who is involved?
HDR was awarded the Design-Build contract and partnered with H2O Innovation as systems integrator. BASF/Inge provided the UF membranes. The RO membranes came from Hydranautics.

What makes it special?

- The UF upgrade now enables the plant to treat raw water with far higher turbidity than before, leading to fewer shutdowns at a crucial piece of infrastructure for the city. Prior to the improvements, Northern California's winter storms would lead to frequent plant shutdowns as the feedwater exceeded the 15 NTU limit of the previous treatment train. The UF facility can now handle 100 NTU in normal conditions and up to 500 NTU during storms, virtually proofing it from the elements. This has enabled San Jose Water to provide better service and take fuller advantage of abundant winter water.

- The plant's new RO system, installed in addition to the main UF train, allows a greater recovery rate as it processes backwash wastewater to reintroduce it into the supply. This enables San Jose Water to make more efficient use of their surface water resources in a context where climate change is rewriting standard operating rules and making seasonal droughts more common.

- The project's sustainable approach was not limited to the treatment train: construction was planned so as to repurpose existing concrete structures rather than spend time, money and energy tearing them down and rebuilding from the ground up. The construction team also used screw presses to reduce solid waste volumes, which made disposal more efficient and required less traffic in the nearby residential neighbourhood.

H2O Innovation's Montevina water treatment plant helps San Jose micromanage its seasonal water usage

PUTATAN 2 DRINKING WATER PLANT, PHILIPPINES

What is it?
A new 150,000m³/d water treatment plant serving Metro Manila. It was built next to the Putatan 1 plant, commissioned in 2011, to serve an additional million people in concessionaire Maynilad's service area.

Who is involved?
Contractor Acciona Agua designed the plant and oversaw project implementation in partnership with Filipino engineers JEC and Frey Fil. Arup acted as project manager on the client's side.

What makes it special?

- In a year when the Filipino capital faced major water shortages and consistently low levels in the Angat dam which provides ▶

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The huge Putatan water treatment plant helped Manila secure its water supply in the face of a savage drought

most of the city's water, the opening of the Putatan 2 plant made a vital difference by allowing west zone concessionaire Maynilad to improve the resilience of its supply, a crucial move for the concessionaire at a time when private water has come under fire in the country. The plant's intake draws from a different freshwater source, Laguna Lake, vastly increasing the security of the city's water resources.

- Putatan 2 deploys world-class membrane technology on a simply unprecedented scale in the Philippines. Following DAF and BAF pre-treatment, the water goes through ultrafiltration followed by reverse osmosis, before a final chlorination step.

- Laguna Lake's waters are considered to be among the world's most challenging to treat due to a high concentration of algae and suspended solids. Putatan 2's state of the art technology is helping Manila break through to this previously-untappable resource with complete ease.

TAI PO WATER TREATMENT WORKS EXPANSION, HONG KONG

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What is it?

A project to double the capacity of the Tai Po Water Treatment Works to 800,000m³/d, making it the second-largest WTP in Hong Kong. The plant now features on-site chlorine and ozone generation facilities and achieves zero liquid discharge of process wastewater.

Who is involved?

Black & Veatch designed and oversaw the project as client consultant for Hong Kong's Water Supplies Department (WSD). A joint venture between China State and ATAL oversaw construction as the design-build contractor. Ozonia provided the ozone generation units while the chlorine generation facilities were sourced from Electrolytic Technologies. Xylem and ATAL provided the biological filtration and rapid gravity filtration units, respectively.

What makes it special?

- The expansion made Tai Po the world's largest municipal water treatment plant to generate chlorine on-site. This innovation is a boon for the area's public safety as it eliminates the risks associated with transporting and storing chlorine at the plant. Chlorine consumption is also reduced by 30% thanks to ozonation.

- With the site surrounded by steep hillsides, the project adopted an innovative stacked design to adapt to the space constraints of its immediate environment. This compact solution saved approximately 32% of land area compared to an equivalent "flat" WTP and enabled the WSD to increase capacity even where land is at a premium, a hugely important achievement for a space-restricted location like Hong Kong.

- The plant has put in place a zero liquid discharge system for process wastewater which returns backwash water and sludge dewatering filtrate to the plant's inlet and uses sampling water as well as harvested rainwater for irrigation on the plot. Sludge from the treatment process is also used as soil conditioner for the plant's green areas and may in future be turned into pavement blocks. The plant is a model for the circular economy.

▶

Hong Kong's Tai Po water treatment plant required careful design to make the msot of its steep location

Fluence's decentralised modular units were the perfect solution for roadside installations in Hubei, China

WASTEWATER PROJECT OF THE YEAR

For the wastewater project, commissioned during 2019, that shows the greatest innovation in terms of optimising its physical or environmental footprint.

ALMAHSAMA DRAINAGE RECYCLING, EGYPT

What is it?

A 1 million m^3/d wastewater treatment and reuse project in Egypt's Sinai Peninsula. Wastewater from Mahsama will be transferred to the new WWTP through two tunnels, after which it will provide irrigation water to approximately 50,000 hectares of land in the peninsula.

Who is involved?

Construction was carried out by a joint venture of Metito and Hassan Allam, who will also operate the plant for five years. Design was supported by consultants Khatib and Alami, with equipment suppliers Stragwa, Turishema, Sulzer, Schnider Electric, Enxio and Sereco. The total project cost was approximately $100 million.

What makes it special?

- Almahsama is the largest reuse project of its type in the world and represents a pioneering step for water reuse and recycling in Africa, where it is still evolving as a sustainable solution to water scarcity.

- The plant will provide a new source of water wealth for the peninsula, creating a new generation of job opportunities in the agricultural sector and contributing to the development of new communities in the area. It also represents a significant step in improving the environmental condition of the peninsula. Previously untreated wastewater would flow into the Temsah lake, causing severe consequences for animal habitats and local fishing culture.

- The project's flawless construction process boasts some truly impressive figures. Work was completed in 10 months, far ahead of the 24-month timeline originally estimated for construction. Additionally, around 1 million m^3 of soil was excavated for tunnel construction and 15,000m^2 of land was paved for the WWTP culminating in 2,528,210 hours of labour with zero lost time incidents.

HUBEI ITEST DECENTRALISED TREATMENT, CHINA

What is it?

A decentralised wastewater treatment project in Hubei province, China, involving the installation of around 80 packaged membrane aerated biofilm reactor (MABR) units at at service areas and tolls every 50km along the province's highway networks. To date, the project has delivered units offering a combined wastewater treatment capacity of more than 9,000m^3/d.

Who is involved?

The project was based on Fluence's Aspiral smart MABR units. An initial bulk order was signed between Fluence and Chinese partner Hubei ITEST in December 2018, followed by five additional orders in 2019. The combined contracts total over $15 million.

What makes it special?

- The MABR L4 and S1 systems offer highly efficient nutrient removal, ideally suited to the high-nitrogen content of the Hubei influent. The units employ simultaneous nitrification and denitrification which result in opex savings and perform reliably in all four seasons and peak travel season variations.

- The modular design serves as an industry pilot for domestic wastewater treatment in the highways field. The units are assembled, tested and packaged in Fluence's manufacturing plants, meaning fast and efficient installation upon delivery. The fastest commissioning of a unit in the project so far has been under four weeks. Additionally, the plants can be remotely monitored and operated in real time via smart device, significantly simplifying the O&M needs of the operator.

- The project has benefitted environmental protection efforts in Hubei. The decentralised units offer a minimal footprint, and the treatment achieves compliance ▶

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The super-flexible Paso Robles wastewater treatment plant can send water to the Salinas River when demand for recycled water is low

with China's stringent rural wastewater regulations by producing the highest quality of effluent.

KOYAMBEDU TERTIARY TREATMENT RO PLANT, INDIA

What is it?

A 45,000m³/d reverse osmosis plant and transmission pipeline in Koyambedu, Tamil Nadu, treating wastewater for reuse at an industrial hub.

Who is involved?

The project was delivered under an $83 million, 15-year design-build-operate contract signed between the Chennai Metropolitan Water Supply and Sewerage Board and a consortium comprising VA Tech Wabag (80%) and IDE Technologies (20%), supported under the Indian government's AMRUT programme. Equipment for the plant was supplied by Inge (low-pressure membranes), Dow and Pentair (RO membranes), Wabag Austria (valves), Bharat Minerals/Kalimati Carbon (sand filters) and Xylem (ozonation units), among others.

What makes it special?

- The plant is the largest and most technologically advanced reuse project in India. It is the first reuse facility in India to use ozonation for disinfection and marks a decisive step for the country's ambitions for municipal water recycling. Furthermore, with the completion of the TTRO, Chennai is now the first Indian city to reuse more than 20% of its treated wastewater.

- The project will boost Chennai's water resilience and sustainability in the wake of the city's ongoing struggles with drought and water scarcity. The TTRO will help free up over 16 million m³ of freshwater each year, securing water supply for Chennai's population of more than 10 million people.

- The TTRO uses a multi-stage treatment scheme, including ultrafiltration, reverse osmosis, rapid gravity sand filters, and ozonation. The UF and RO membranes achieve a recovery rate of 75%, and the plant has an ultra-low specific power requirement of 1.88kWh/m³, which is expected to incur significant savings in the plant's operating costs over the next 15 years.

PASO ROBLES WWTP, USA

What is it?

A tertiary treatment upgrade at the 18,546m³/d Paso Robles WWTP, California, including the development of a nutrient harvesting system, with treated water used for irrigation at local farms, golf courses and parks.

Who is involved?

Black & Veatch carried out project design and engineering services under a contract with the City of Paso Robles. Construction was undertaken by Cushman Contracting. Cloth filtration equipment was provided by Aqua-Aerobic Systems, and UV equipment by Trojan UV Technologies.

What makes it special?

- The project massively improved the plant's physical and environmental footprint and serves as the first step in the city's long-term plan to create a resilient and sustainable water supply. The expanded WWTP converts wastewater into California Article 22-compliant recycled water for irrigation, a crucial move in supporting the city's water resilience.

- The nutrient harvesting system was conceived and developed during construction of the tertiary treatment facilities when it became evident that lower flow conditions had caused a struvite build-up in piping and equipment. In addition to preventing struvite build-up, the harvesting system keeps phosphorus, nitrogen and ammonia from overloading local and state water resources. It also produces a commercial-grade fertiliser which can be sold to subsidise operating costs.

- The flexibility of the design means the plant can send water to the Salinas River when demand for recycled water is low. The tertiary treatment process flows by gravity, eliminating the need for pumping and thereby saving equipment and energy expenses. Additionally, repurposed secondary sedimentation tanks that had previously sat unused allow disinfection processes to operate continuously and at a more constant rate.

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INDUSTRIAL PROJECT OF THE YEAR

For the project, commissioned in 2019, that represents the most impressive technical or environmental achievement in the field of industrial water and wastewater.

ARAMCO PRODUCED WATER DESALINATION, SAUDI ARABIA

What is it?

A successful pilot test of a mechanical vapour compression (MVC) desalination unit using produced water as feedstock, with water treated for reinjection.

Who is involved?

The project was funded and carried out by national oil company Saudi Aramco. Technology provider Vacom designed and built the MVC desalination unit, with Tahliyah as their local representative in Saudi Arabia.

What makes it special?

- The extreme salinity of produced water in Saudi Arabia makes it almost impossible for conventional desalination technologies to handle. However, this new unit was able to adeptly handle produced water with salinity levels of 100,000 mg/l and treat it to a suitable level for reuse. The distillate water is of the ideal quality to use in Aramco's crude oil washing, well maintenance and drilling operations.

- Now that the pilot has proven itself, this process offers the potential to play a crucially important part in the future of produced water reuse in water stressed regions such as Saudi Arabia. Aramco plans to use this new technology to kick off a wide-ranging programme of reuse in its oil operations, with potential total groundwater savings of 2.2 billion gallons annually after full implementation.

- The implications of this test will be felt beyond the boundaries of Aramco's own activities. By increasing produced water reuse in the oil and gas sector, more groundwater will be available for non-industrial applications in Saudi Arabia, which reduces reliance on seawater desalination and frees up crucial resources for use elsewhere.

PETRONAS IETP, MALAYSIA

What is it?

A 102,000m³/d integrated effluent treatment plant (IETP) and sludge handling system for the Petronas RAPID Refinery at the Pengerang Integrated Complex in Johor, Malaysia.

Who is involved?

The contract was awarded to a joint venture comprising VA Tech Wabag, which took the lead on engineering and procurement, and local partner Muhibbah Engineering. Technip and AMEC Foster Wheeler were responsible for the front-end engineering design of the project and Fluor Corporation acted as project management consultant. Equipment included a high-pressure wet air oxidation system provided by Siemens Energy and a sludge dryer from Watropur.

What makes it special?

- The sheer scale of the treatment plant is impressive: as one of the largest IETPs in the world, it treats seven complex oily effluent streams including spent caustic. Its success is critical to the operation of the colossal refinery and petrochemicals complex, which itself is Petronas' largest project ever.

- Collaboration between the client, consultant and contractor was a top priority, aided by the integration of smart solutions. Software such as SmartPlant 3D and Wrench was used to streamline the design and project control processes, and optimise the implementation schedule.

- Sustainability was at the heart of the project, with the IETP designed to meet the International Finance Corporation's global discharge regulations. The plant will serve as a model for advanced effluent and sludge treatment for refinery and petrochemicals discharge for similar projects across the whole of Southeast Asia and the Middle East.

ROY HILL MINING WATER SUPPLY, AUSTRALIA

What is it?

A 20,000m³/d water treatment plant and 4.3km pipeline serving the Roy Hill iron ore mine in the Pilbara region of Western Australia.

Who is involved?

The project was delivered by Osmoflo under a 20-year design, build, operate and maintain contract, with most services carried out in-house. The Australian company also supplied the plant's reverse osmosis membrane system, with pre-treatment technologies including mixed media and cartridge filtration. Osmoflo is using its PlantConnect software for remote monitoring of the plant.

What makes it special?

- The key challenge of the project was contending with the difficulties of the mine's location. Set in a remote and arid spot 1200km from the nearest city of Perth, the tricky conditions include high ▶

The Petronas IETP in Malaysia is one of the largest of its type in the world and treats an array of nasty effluents

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temperatures, cyclones and unpredictable rainfall. The design of the plant accounts for variations in feed water with optimised chemical and power consumption. A flexible approach to construction was also required: the plant was fabricated at Osmoflo's manufacturing facility in South Australia and then transported 3,400km to the Roy Hill mine for installation.

- Repurposing water from bore fields is a top priority at the plant. Water typically discharged back to the environment is now a crucial ingredient in the desalination process, conserving groundwater resources and producing high-quality water to wash impurities from the iron ore.

- In addition to increasing reuse, the plant contributes to maintaining sustainable groundwater levels in the area. A 4.3km pipeline was installed to pump the excess brine produced by the plant to a downstream managed aquifer recharge system.

SEAWATER ENERGY AND AGRICULTURE SYSTEM, UAE

What is it?
The world's first bioenergy facility using saltwater to produce seafood and aviation biofuel in the desert environment of the UAE. The two-hectare pilot system is based in Masdar City in Abu Dhabi.

Who is involved?
Jacobs provided design and engineering services for the Sustainable Bioenergy Research Consortium at Khalifa University. The project was carried out in collaboration with Boeing, Etihad Airways, Honeywell UOP and the Abu Dhabi National Oil Company. Construction was done by the International Mechanical & Electrical Company.

What makes it special?
- This project is characterised by cross-industry co-operation to implement sustainable biofuel production and create an agricultural alternative in the UAE. In January 2019, Etihad Airways operated the first commercial flight using biofuel from the project from Abu Dhabi to Amsterdam.

- The innovative setup of the system ensures that the maximum potential is extracted from each stage. Seawater is used to cultivate aquaculture in six ponds of 1,400m³ in total, with the nutrient-rich wastewater used to fertilise salicornia plants which can then be harvested for biofuel. Excess water is channelled to mangrove forests, which absorb carbon, purify the water and shelter fish nurseries.

- Its success demonstrates the viability of using saltwater for halophyte agriculture in the desert environment of the UAE, avoiding the use of precious groundwater and arable land to produce biofuel. Its environmental integration even extends to the use of on-site solar panels to power the system's pumps and valves. The next step is scaling the system up to a 200-hectare site, in a move towards full commercial implementation.

SMART WATER PROJECT OF THE YEAR

For the project that most effectively harnessed digital solutions to achieve excellence in water or wastewater management in 2019.

ANTELOPE OILFIELD WATER BLOCKCHAIN MANAGEMENT, USA

What is it?
A blockchain-based smart contract system supplied by Houston-based Data Gumbo managing and assessing the use and transportation of water for oilfield water service company Antelope Water Management in the Permian Basin. The system reads metered barrels of produced water from a well location and matches data with a field ticketing system all the way through to the disposal facility.

What has it done?
It is the first deployment of a blockchain platform for total water management in US shale plays, and sees a technology more often seen in the offshore drilling side of the business shifted to the water business. Both wellfield operator and disposal facility see the same accurate data and can bill based on matching data, allowing them to monitor and manage the increasingly costly business of oilfield water.

What makes it special?
- One of the biggest inefficiencies in the oil and gas sector is the management and disposal of produced water. As regula- ▶

The installation of Osmoflo's treatment plant at the Roy Hill mine was a masterpiece of logistical management

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tory focus increases, the ability to instantly transact metered data in real time without inaccuracies and among multiple parties, allows everyone to squeeze the best possible in terms of value from water management.

- The process offered immediate cost reductions – operators can expect to realise cost savings of 25% at wellpads compared to managing their water disposal on a 'dumb' basis.

- The installation came at a time of rapid change for the shale oil water management market. Antelope has bene a leading proponent of centralised water recycling facilities in a Permian market that has traditionally been very disparate. Having a tight rein over costs makes its ambitious plans all the more realistic.

MOGILEV SMART WASTEWATER MANAGEMENT, BELARUS

What is it?
An integrated plant process control automation and management system covering sewage pumping stations owned by the water utility for Mogilev, a city of 350,000 people in eastern Belarus. The system uses intelligent algorithms to predict demand, identify leaks and monitor equipment conditions, reduction maintenance costs dramatically.

What has it done?
The supply of the Aquatoria system developed by Technikon and Mitsubishi Electric integrated information from across the water network to locate inefficiencies and keep pumps operating at optimal efficiency.

What makes it special?
- The process has hugely cut back costs for a under-pressure water utility, reducing energy consumption by a massive 15% and decreasing network pressure by 7%. The project has simply transformed the city's ability to manage the costs associated with its water infrastructure.

- By providing an integrated control system which brings together water and process data flow to give a real-time image of an entire network's operations, the utility can now identify and correct inefficiencies at lightning pace.

- The use of virtual reality technology to train staff allowed for the instantaneous sharing of skills and insight and mean the simulation of alarms and emergency cases could be fully tested in order to guard against any possibility of service interruption at the city's crucial water facilities.


Italy's Nosedo plant was perhaps the greatest success to date for Veolia's high-end Aquavista system

NOSEDO AQUAVISTA PLATFORM, ITALY

What is it?
A digital water platform at the Nosedo WWTP in Milan, the largest full agricultural reuse plant in Europe with a capacity of 1,250,000 p.e. Veolia's Aquavista system brings together data from across the treatment plant and the sewer network to anticipate flow peaks in wet weather and automatically optimise consumption of chemicals, energy and hydraulic performance.

What has it done?
By integrating the operation of the sewer network and the WWTP to maximise technical efficiency, Aquavista has effectively increased hydraulic performance without building new facilities. This has also yielded operational savings of close to €400,000 per year.

What makes it special?
- As perhaps the most significant reference to date for Aquavista, the work at the enormous plant provides a suite of process control capabilities for wet weather conditions that have completely overhauled operations at a critical piece of national infrastructure.

- The operational improvements allow for energy use reduction of up to 30% at the plant, a staggeringly important achievement for one of the world's most energy-intensive sectors.

- Through the digital platform, customers can access operational support directly from Veolia, including site visits, access to troubleshooting online, and emergency support. Aquavista also provides operator training resources, as well as intra-community support and communication, flawlessly bringing together the expertise of public and private sectors.

SAFESWIM PROGRAMME, AUCKLAND, NEW ZEALAND

What is it?
A smart solution to water quality prediction, using analytics to understand the complex behaviour of the city's wastewater network, storm drainage systems and the natural environment to forecast water quality across 109 beaches. Information is distributed online and through a free app.

What has it done?
With 3,700 kilometres of coastline, Auckland boasts some of New Zealand's finest beaches but sewage overflow, especially after heavy rain, can pose serious health risks to swimmers and surfers. Mott ▶ MacDonald's data management and ana-

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Swimmers can tackle the surf at Auckland's beaches fearlessly as the Safeswim programme combines reams of digital utility data for live updates on water quality

lytics platform, Moata, processes 8 billion data points every day, aggregating information on wastewater overflow, weather patterns and tidal movements to forecast water quality.

What makes it special?

- The system brings together hundreds of data streams and around a dozen contributing organisations to make sense of water information in a notoriously fragmented utility background. The upshot is that 1.4 million Auckland residents and more than 3 million annual visitors can make informed decisions about where and when to swim.

- As the first programme of its kind to successfully predict future water quality, Safeswim is one of the most comprehensive, federated digital twins currently in operation, expertly demonstrating the concrete life improvements that smart water can provide.

- The programme has also highlighted the value of effective wastewater infrastructure, prompting widespread public support for a rate increase to fund a NZ$400 million investment to improve water quality in the region.

WATER DEAL OF THE YEAR

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For the project finance deal, signed in 2019, which made the biggest contribution to the advancement of private sector participation in the international water sector.

KANPUR STP FINANCING, INDIA

What is it?

The financing package supporting the INR8.2 billion ($114 million) project that will see the construction of three sewage treatment plants (STPs) in Kanpur city, Uttar Pradesh with a combined capacity of 50,000m³/d, alongside rehabilitation of an existing STP and extensive network improvements.

Who is involved?

The project is being developed under a 15-year hybrid annuity model (HAM) contract by a consortium of Shapoorji Pallonji and SSG Infratech on behalf of the client, local utility UP Jal Nigam, which was supported by the National Mission for Clean Ganga (NMCG) programme. Debt finance for the privately-financed portion of the deal was provided by IndusInd Bank.

What makes it special?

- The project was the largest to reach financial close in 2019 under the NMCG programme and provides a vision of the scale and importance of works that can be completed under the crucial national effort, at a time when the returning government promised to extend the model created by the NMCG to every part of the country.

- The deal acted as pathfinder by combining the complex structure of the HAM contract model with the 'one-city, one-operator' model where related infrastructure is clustered under a single operator. The streamlining of operations demonstrates that PPP can pay off away from process plant contracts in India, and offer a holistic solution in the worst-polluting city on the holy Ganga river.

- The scale of the project, and the willingness to innovate at Kanpur have given a big impetus post-to a lacklustre project finance market in India and have encouraged larger players to participate in bids for projects. The future looks bright for private finance in India.

SHUQAIQ 3 IWP FINANCING, SAUDI ARABIA

What is it?

A $600 million funding deal assembled to fund the construction of a 450,000m³/d privately owned desalination plant on Saudi Arabia's Red Sea coast.

Who is involved?

The project was rolled out by the country's central PPP body the Saudi Water Partnership Company (SWPC). The 25-year build-own-operate contract was secured by a project development team comprising Marubeni (45%), Almar Water Solutions (30%), Rawafid Holding (15%) and Acciona (10%). $450 million of senior debt was provided by a team of banks including local players NBC and Samba, and international lenders Crédit Agricole, MUFG, Norinchukin and SMBC. ▶

What makes it special?

● Despite the scale of the plant and the relative newness of the revitalised Saudi water PPP project rollout, the developers secured final signoff on the financing package less than three months after the signing of the water purchase agreement – a stunning testament to the security of the Saudi project finance market, and the sustainability of the dozens of major projects lined up for the years to come.

● The billions of debt that will be required to sustain Saudi Arabia's PPP rollout will require a colossal amount of liquidity from the international banking sector: the close involvement of both Saudi lenders and the best of the international debt providers shows that there is no limit to the appetite for Saudi water investment from the very highest echelons of the regional and international banking sector.

● Despite security threats in the region to water infrastructure, procurement of the project and the financial package proceeded at a rapid and smooth pace. The combination of hungry debt investors, skilled project developers and a buccaneering and reactive offtaker meant the project came in priced at a highly-competitive tariff of $0.52/m³, pushing the envelope of desalination pricing to the limit.

TAWEELAH IWP FINANCING, UAE

What is it?

An AED3.19 billion ($870 million) financing package supporting the construction of the world's largest membrane desalination plant, a 909,200m³/d facility in Abu Dhabi.

Who is involved?

Project developer ACWA Power will hold a 40% stake in the plant, with the remainder split between state bodies ADPower (20%) and Mubadala (40%). ADPower subsidiary the Emirates Water and Electricity Company is the offtaker. The AED2.71 billion ($740 million) debt package was supplied n a group of banks including Bank Boubyan, Emirates NBD, Mizuho Bank, Natixis, the Norinchukin Bank and Siemens Bank.

What makes it special?

● The project incorporates 50MW of on-site solar power generation, a radical breakthrough on design that allowed the developer to slash the plant's expected energy bills and offer an ultra-competitive bid, demonstrating the burgeoning link between water infrastructure and renewable energy.

● The micro-managed design, close collaboration with lenders and envelope-pushing at every stage of the procurement process allowed the project developers to submit an offer that turned out to be impossible to refuse: at $0.49/m³, the tariff for water from the plant was the lowest ever seen in the desalination market, and established a benchmark that will influence project planners for years to come.

● The project came amid a period of radical reorganisation at Abu Dhabi's water utility sector structure. Despite the changing of clients and offtakers over the course of the project, the procurement process ran smoothly over a two-year period to deliver a facility that will redefine how the scale and cost of seawater desalination can be managed.

Source: Shutterstock

Financing water in the city of Semarang is a tricky prospect, but one that our award nominees managed with aplomb

WESTERN SEMARANG WATER SUPPLY FINANCING, INDONESIA

What is it?

An IDR417 billion ($31 million) investment funding the construction of a major water supply project in Indonesia's Central Java province. The project includes an 86,400m³/d water treatment plant, 9km supply pipeline and three new reservoirs, serving the city of Semarang.

Who is involved?

The project will be developed by Moya subsidiary Aetra Air Jakarta (75%) and partner Medco Gas (25%) under a 25-year build-operate-transfer contract, on behalf of the client, the municipal water company of Semarang City. The finance package includes an IDR265 billion ($18.4 million) loan facility from Overseas-Chinese Banking Corporation. Indonesia's Ministry of Finance will supply viability gap financing, while the project is secured by a government guarantee provided by the Indonesia Infrastructure Guarantee Fund.

What makes it special?

● Close work between government guarantors, international backers and the developers meant that project award and financial close was secured smoothly in one of the world's most difficult markets for private finance. With a legacy of failed projects to contend with, success at Western Semarang required a boldness in bidding and extremely careful support from the client, meaning success is a truly admirable achievement.

● PPP in Indonesia has been a notoriously slow process in the past even where it has succeeded. By racing from project award to financial close within six months, the project developers and their clients showed that private finance ▶

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Nyewasco stands head and shoulders above its Kenyan neighbours in terms of performance – it is increasingly becoming a model of regional excellence in addition

today can not only make a major difference for the country's desperately needed water infrastructure, it can do it at a pace that matches even the most well-established project finance markets in the world.

- By planting a flag for PPP, the project opens up a huge range of opportunities for Indonesia to tap new sources of finance for desperately needed water supply infrastructure. By reducing subsidence from groundwater over-abstraction and moving the city significantly towards its 100% clean water supply target, the Western Semarang deal offers a picture of a future that looks very bright for Indonesia.

WATER LEADERS AWARD

For the most dramatic performance improvement in a water utility in the developing world in 2019.

NYEWASCO, KENYA

What is it?

The Nyeri Water and Sanitation Company, otherwise known as Nyewasco, is the water and wastewater service provider for the city of Nyeri in Kenya. It was established in 1997 and now serves around 800,000 people.

What has it done?

Nyewasco raced ahead in 2019 to become Kenya's leader in utility performance, both providing a better service to the local community of Nyeri and reducing operational waste while building overall efficiency. Nyewasco's innovations and performance are quickly becoming the gold standard for sub-Saharan water services, with a number of others looking to Nyeri for guidance. The utility is now coaching other utilities from the region utilities such as the Malawian Central Region Water Board in efficient billing, customer service, renewable energy and mapping.

What makes it special?

- Nyewasco's operational performance has been head and shoulders above other water utilities in the country, bringing non-revenue water levels down to just 16% in 2019, compared to the national average of 41%.

- Nyewasco extended its successful urban coverage into low income areas and informal settlements in 2019 by radically rethinking its customer service charter and making a 'pro-poor policy' central to its decision-making strategy.

- The utility's steep upward trajectory with regards to performance is reflected by its booming bankability. Nyewasco was one of only three utilities - out of Kenya's 72 - to be given a clean bill of health in the 2019 national audit, showing it has effective utilisation of public funds and best management practices at its very heart.

OBRAS SANITARIAS MAR DEL PLATA-BATÁN, ARGENTINA

What is it?

Obras Sanitarias Mar del Plata-Batán (OSSE) is the municipal water utility operating in Mar del Plata, Argentina, providing water, wastewater and rainwater capture services to more than 600,000 people.

What has it done?

OSSE dramatically increased its service area over the last year, bringing clean safe water to the city of Mar del Plata, and contributing to its efforts in meeting Sustainable Development Goal 6 targets for water and sanitation. The utility's achievements in improving its performance and services are even more dramatic when seen in light of the many recent challenges that OSSE has overcome, such as high temperatures driving scarcity, combined with increasing water demand.

What makes it special?

- OSSE completed major network extensions in 2019, including upgrades that now provide 10 hours of water reserve, a crucial development in an area where shortages can be a risk. The works completed mean the area now has 97% coverage for both water and wastewater services, significantly improving the living conditions of the local population. Meanwhile . The improvements to infrastructure have significantly reduced maintenance costs and driven energy efficiency for the utility.

- The utility made major breakthroughs on key water projects in 2019. It completed its Acueducto Oeste System pro- ▶

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gramme, a project which included 74 wells which increase water production, as well as the extension of the Mario Bravo Supply Center, adding further to the region's reserve capacity.

- On top of this, the utility made major operational improvements at the Talcahuano Water Lift Station which is the primary link to the Southern Aqueduct groundwater system. The upgrades extended the life of the station by at least 30 years and means it now operates automatically, with equipment that mean supply varies only according to the demands of the water distribution network, eliminating wastage.

OFFICE NATIONAL DE L'ASSAINISSEMENT DU SENEGAL

What is it?

The national sanitation utility of Senegal. It serves more than 15 million people over an area of almost 200,000km^2.

What has it done?

Office National de l'Assainissement du Senegal (ONAS) was the driving force behind major sanitation improvements nationwide in 2019. Decentralised wastewater treatment options, combined with the development of traditional centralised facilities, fostered an efficient circular economy for the utility and local communities, laying the foundations for scaling up toward even greater impact in the years to come.

What makes it special?

- ONAS made tailored plans for both rural and urban communities a priority in 2019 in an effort to ensure sanitation for all is achieved in the fastest and most efficient way. Across the country, the number of sanitation connections increased by 375% in the past year, and this figure is projected to increase this by another 117% in 2020.

- Driving the successful increase in sanitation in Senegal was the construction of a new fecal sludge treatment plant and the introduction of an 'omni processor unit'. The 400m^3/d unit has not only increased sanitary living conditions, but contributed to the circular economy through the generation of electricity and production of recyclable ash.

- The development of a comprehensive communications plan helped drive community acceptance for three new models of innovative toilets which are tailored for flood zones. These new models have reduced the average cost of pit emptying in the country from $51 to $38. By combining community involvement and market-leading technology with local application, the utility is rapidly becoming a model for disruptive innovation in the water and sanitation sector, improving and integrating the non-sewered sanitation value chain.

ONAS explored new angles for non-sewered sanitation services that made a huge difference for Senegal in 2019

OFFICE NATIONAL DE L'EAU ET DE L'ASSAINISSEMENT DU BURKINA FASO

What is it?

ONEA, the Office National de l'Eau et de l'Assainissement du Burkina Faso, is the national water utility of Burkina Faso, providing water and sanitation services to the country's population of more than 18 million.

What has it done?

Overcoming the extreme challenges which Burkina Faso faced last year, such as chronic drought and humanitarian challenges, the national utility has strove to expand its services and increase service reliability across the country. Against the odds, ONEA is improving the lives of millions of people through the increased provision of clean safe water services.

What makes it special?

- ONEA kickstarted the implemented of its 2019-20 Water Supply and Sanitation Program (PAEA) to improve access to drinking water and sanitation in urban and rural areas. The programme includes constructions of 300 boreholes, including a dozen high-speed boreholes already under way to supply drinking water in previously underserved areas.

- The utility completed the construction of its second major treatment plant and laid new pipes to connect Ziga and Ouagadougou, building greater resilience into national-level water security. While the demand gap that led to the construction of the plant was estimated at 59,922,500 m^3/year, the utility has built in extra capacity (up to 95,690,000 m^3/year) to hedge the risk of continued or even more extreme water scarcity.

- Distribution systems were strengthened between the two major branches of the utility in the country's northern and southern regions. Significant amounts of pumping reinforcement equipment were installed in order to integrate previously isolated systems, a move that has generated greater resilience against localised water scarcity and enhanced clean, safe water access for thousands of residents. ■

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saudi water forum SWF 2020

Water Sustainability & Global Responsibility

17-19 March 2020
Hilton Riyadh Hotel & Residences

13-16 March 2020: Regional and Accompanying Activities

The Ministry of Environment, Water and Agriculture is glad to announce the launch of the **2nd edition of the Saudi Water Forum "SWF 2020"** which will be held from **March 17th to 19th 2020 at the Hilton Riyadh Hotel & Residences.** The Forum will witness the main participation of the Saline Water Conversion Corporation (SWCC), National Water Company (NWC), the Saudi Water Partnership Company and the Saudi Irrigation Organization.

FORUM OBJECTIVES

The forum has **four main objectives** putting the event on the map of local and international water-related events

- Strengthening water security & sustainability
- Exchange & localization of experiences to achieve water resources sustainability
- Attracting investments within the water industry
- Achieving integrated water resources management

FORUM TOPICS

The forum program is comprised of **10 main topics** namely:

01 Water Industry Privatization and Investment

02 Drinking water quality

03 Promising technologies within the water industry

04 Traditional water resources benefits enhancement

05 Renewable water... reality and challenges

06 Operational excellence and smart networks

07 Alternative energy in water desalination and purification

08 Integrated water management

09 Education and capacity-building in the water sector

10 Commercial application evolution in water desalination and purification plants

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7330 N Sam Houston Parkway W, Ste 100 Houston, TX 77064
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