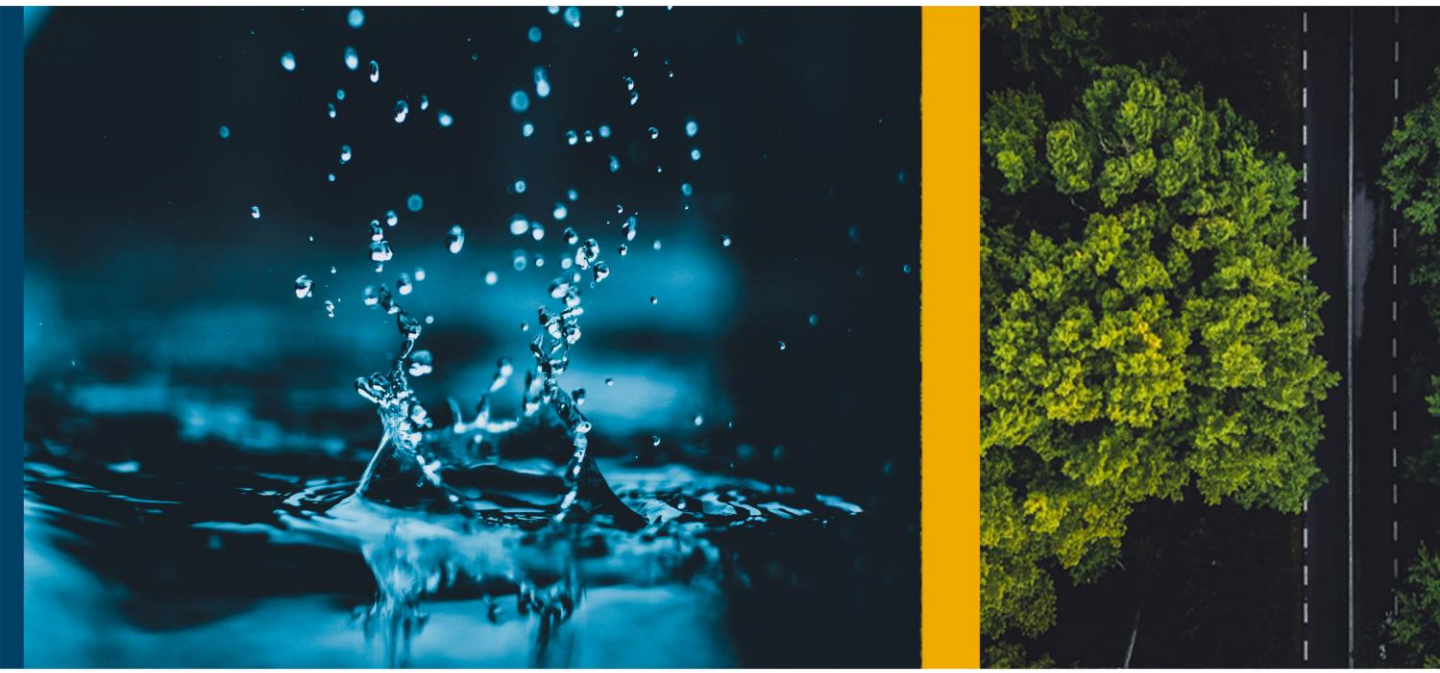
BDA PARTNERS

The global investment banking advisor for Asia

Turning on the tap for water investment

4th July 2023



Overview

BDA Partners has significant experience across the water M&A spectrum. Our transactions include water infrastructure, concessions, technology, EPC (engineering, procurement and construction) services and water chemicals. Our dedicated Sustainability Team, spread across our nine offices worldwide, works seamlessly to provide expert advice to our water clients and to facilitate solutions wherever needed.

This thought piece will first explain some of the global water issues and the background for the continued growth in demand for water and wastewater treatment solutions. We then present some observations on the current market, including selectively on trends and innovations. We take a look at related global water M&A as well as valuations, and have also collaborated with BlueTech Research, the world's leading water commercial due diligence advisor, to provide additional proprietary market insights. For the purposes of this paper, we have excluded topics around utilities and financing for projects and infrastructure.

Please reach out to the Sustainability team should you wish to find out more.

Selected BDA cross-border water transactions

Not disclosed

DOOSAN Enerbility

Divested Doosan Enpure to

Skion WATER

2022

Water engineering and procurement services, and water technologies

Not disclosed

CLEARON CORP.

Acquired by

SOLENIS

2022

Water chemicals for industrial and household water treatment

Not disclosed

Divested a stake in Al Dur Power & Water to

KYUSHU ELECTRIC POWER CO.,INC.

2021

Middle Eastern local water desalination infrastructure

~US$840 million

SK E&C

Agreed to acquire 100% of EMC Holdings from

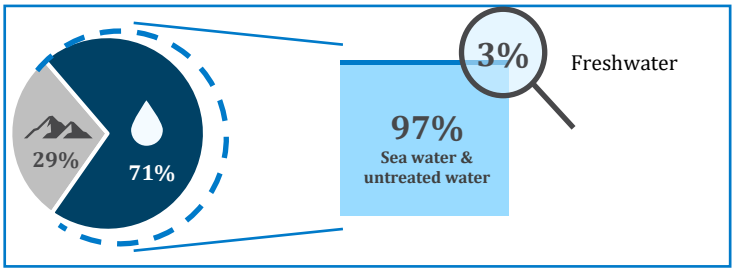
AFFIRMA CAPITAL

2020

Largest Korean wastewater treatment company

Contextualising the global water problem

Whilst 71% of the Earth's surface is covered in water, a mere 3% is readily usable freshwater[1]. 97% is too contaminated or salty for drinking, watering crops or even industrial usage, causing global water scarcity.



15,415
Litres
required to produce
one kilogram of beef
(Water Footprint Network)

3,781
Litres
required to produce
one pair of Levi jeans
(Levi Strauss & Co)

132
Litres
required to produce
one small cup of coffee
(Water Footprint Network)

Agricultural applications in particular are extremely water intensive, using 70% of globally available freshwater. To contextualize this further, more than 15,000 litres of water are required to produce just one kilogram (2.2 lbs) of beef[2].

Demand for water is expected to increase 30% by 2050[3], but freshwater reserves are already running dry and other sources are often contaminated. The scarcity is driven by a variety of factors, including:

Increasing demand	• Rapid population growth and urbanisation increases demand for water considerably
Evaporation	• Extreme temperature swings, including recent heat waves driven by glob al warming, are causing greater evaporation of surface and ground water
Contamination	• Industrial waste, residue from fertilizers, PFAS, radioactive material (esp. in MENA) and other contaminants are polluting water
Deforestation	• Large scale deforestation is lowering the capacity of soil to retain water, significantly impacting water tables

All corners of the world are now seeing unprecedented, yet often very different, water challenges. In India, nearly 70% of water is deemed to be contaminated by raw sewage, silt and garbage, impacting three out of four Indians[4]. Drought is also an issue globally, for example China's mighty Yangtze river, a key transport artery for the nation, which partly dried up in 2022, affecting hydropower generation, halting shipping and forcing companies to suspend operations[5].

In the West, the United States is currently battling PFAS contamination in water – "forever" chemicals that are now found throughout the food supply and linked to harmful effects in humans and animals[6]. Meanwhile in last year alone, the United Kingdom saw 300,000 separate cases of raw sewage being discharged into rivers, due to under-capacity of wastewater/sewage treatment infrastructure.

As water pressures grow, all stakeholders (including governments, corporations, and funding providers) are required to rethink regulatory approaches, supply chains, and business models, opening opportunities for new investment and M&A activity.

Key water issues and trends by region – BDA's perspective

Americas

Key water problems:

- North America faces deteriorating, aging water infrastructure, with an annual investment gap for American water infrastructure est. at US$81bn[8]
- Water contamination is another major issue, for example PFAS – a "forever" chemical found in drinking water, contaminates 80% of US waterways[9]
- South America's water concerns are magnified by a 3-year dry spell[10], with 77m people lacking safe water access. Extensive mining also drives heightened water treatment demand in Latin America

Key water growth trends:

- Joe Biden's "American Jobs Plan" allocates US$111bn for investment into improving national water infrastructure, incl. US$10bn for PFAS remediation[11]
- Increase in public-private-partnerships for financing and enhanced efficiency, innovation and project delivery
- Construction of desalination plants, which will serve up to 36% of the Latin American mining sector by 2025 (vs. 9% now)[12]

Technologies to watch:

1. PFAS destruction technologies (e.g., supercritical water oxidation) to supersede PFAS incineration

Europe

Key water problems:

- Aging infrastructure across the continent; water mains in England are 60+ years old on average[13], and in Germany, c. 60,000 km of public sewers are in need of repair[14]
- Strong focus in the United Kingdom on phosphorus removal from water
- European cities are struggling to keep untreated sewage out of rivers due to capacity constraints

Key water growth trends:

- Implementation of the European Green Deal of 2022, aiming for wastewater to be energy neutral by 2040; requiring the removal of micro-pollutants to be paid by the polluter, thus facilitating a circular water economy[15]

Key technologies:

2. Aerobic and Anaerobic Technologies

Middle East & Africa

Key water problems:

- General scarcity: one third of Africa's population lacks access to safe drinking water[16]
- Natural radioactivity (e.g., radium) in water aquifers, particularly in the Middle East

Key water growth trends :

- Major hotspot for the construction of desalination plants; significant complementary renewable investment[17]

Technologies to watch:

4. Innovation in membranes (e.g., coating solutions, ceramic and ion exchange membranes) for filtration and desalination purposes

Asia Pacific

Key water problems:

- According to the Asia Development Bank, 80% of the continents wastewater is discharged without treatment, driven by weak capacity, high capital costs, lack of awareness and low priority on policy agendas[18]
- Significant flooding due to stormwater, particularly in Bangladesh, India, Indonesia and China – home to over 40% of the world's population

Key water growth trends:

- Asian Development Bank plans to leverage $10 billion in climate change adaptation financing for the water sector in Asia-Pacific by 2030[19]
- China is investing a total estimated US$470bn by 2025, with 36% invested into inter-basin water diversion projects, 13% dams/pumping stations, 36% for floor control measures and 15% for new irrigation systems[20]
- Multiple STP and WWTP plants under development under Clean Ganga Initiative in India
- Japan International Co-operation Agency's Clean City Initiative plans to expand water services in over 40 cities across Asia Pacific by 2030[21]

Key technologies:

3. Most technologies given underlying need for more treatment capacity, including both traditional methodologies and more modern solutions (including Membrane Aerated Biofilm Reactors and other bubble-less technologies)

Note: Aforementioned water technologies are not exclusively applicable to referenced geographies

Investible water technology propositions – key technologies to watch

Notable technologies that are transforming the water sector:

1 New PFAS incineration technologies are coming into the spotlight

- Historically, PFAS was removed, collected and ultimately incinerated , usually at above 1,000 degrees Celsius
- New technologies such as supercritical water oxidation (e.g., by Revive Environmental) or hydrothermal alkaline treatment (e.g., by Aquagga) are innovative solutions with lower energy requirements and high destructive efficacy, and which are poised to take advantage of the United States' US$10bn allocation to PFAS remediation

2 Aerobic and Anaerobic technologies are increasingly deployed

- These are technologies that utilise natural organisms (e.g., bacteria) to break down organic waste in water
- Anaerobic solutions are rapidly gaining traction due to the potential for energy recovery and reduced GHG emissions
- Nevertheless, aerobic alternatives are also growing, including activated sludge, such as Bluewater Bio's "HYBACS" which reduces cost, energy and importantly the footprint (particularly for tight urban areas)
- Membrane bioreactors are also becoming more established

3 Aerobic technology with a twist: Membrane Aerated Biofilm Reactor Technology

- Falls under aerobic process technologies, but considered to be a more energy efficient approach compared to traditional aerobic treatment systems
- Other advantages include reduced physical footprint, nitrification capabilities and enhanced oxygen transfer, and thus are gaining significant traction across Asia Pacific

4 Significant innovation within membranes as an alternative to incumbent polymer solutions

- Membrane coating solutions: U.K.-based Evove raised ~US$10m to supply 3D printed coating solutions globally
- Ceramic membranes: German-based Cerafiltec raised ~US$30m to spur growth of low-cost ceramic membranes
- Ion exchange membranes: U.S.-based Membrion raised ~US$10m to catalyze growth

Note: Aforementioned water technologies are not exclusively applicable to referenced geographies

Our view on water M&A and valuation (1/3)

There is a scarcity of mid-sized water assets. Smaller technology transactions are more common as well as broader market consolidation. There is also an emergence of water platforms, often private equity or family office backed, bringing synergies and scale to portfolio companies. Acquisitions of quality mid-market water assets are consequentially highly sought after and command a premium valuation.

Selected water platform case studies

GRADIANT

- Water platform based in USA and Singapore, closing a US$225m funding round in May-2023, resulting in a unicorn valuation
- Investors include Warburg Pincus, BoltRock and Centaurus Capital
- Highly acquisitive platform, with 4 years of >100% YoY sales growth

Skion WATER

- Water dedicated family office of Suzanne Klatten, serial entrepreneur and the heiress of the BMW-family fortune
- More than seven acquisitions in the last 12 months, including the acquisition of Doosan Enpure, a transaction led by BDA Partners

Axius water

- Founded in 2019 by global private equity KKR and XPV Water Partners, Axius is a leading water treatment platform
- The group currently consists of four acquired firms, collectively addressing nutrient contamination in water

Examples of recent significant industry acquisitions

xylem + EVOQUA WATER TECHNOLOGIES

- In May 2023, Xylem completed the acquisition of Evoqua for US$7.5bn at a 27.3x EBITDA multiple
- Evoqua itself undertook seven water transactions since 2020
- The combined entity has over US$7.0bn in revenues

SK E&C + emc Environment Management Corporation / AFFIRMA CAPITAL

- In Dec 2021, BDA advised SK E&C on the acquisition of EMC, the largest Korean wastewater treatment O&M provider for US$843m
- Affirma Capital is est. to have made a double digit multiple on the sale

Other recent private equity deals in the water landscape

Mar-23: Sun European Partners bought MegaGroup Trade, a piping and drainage component provider

Feb-23: Morgan Stanley Capital Partners acquired Apex, a water & environmental consulting company

Feb-23: Turnspire Capital Partners acquired USG Water Solutions, a water asset management provider

Feb-23: Flotilla Partners acquired a group of water treatment service companies

Sources: Mergermarket, CapitalIQ, BDA Partners

Our view on water M&A and valuation (2/3)

Asset scarcity, combined with strong investor appetite and high growth profiles, results in multiples typically in the double digits.

Recent notable water M&A transactions (US$m)

Denotes BDA-led transactions

Non-exhaustive, selected only

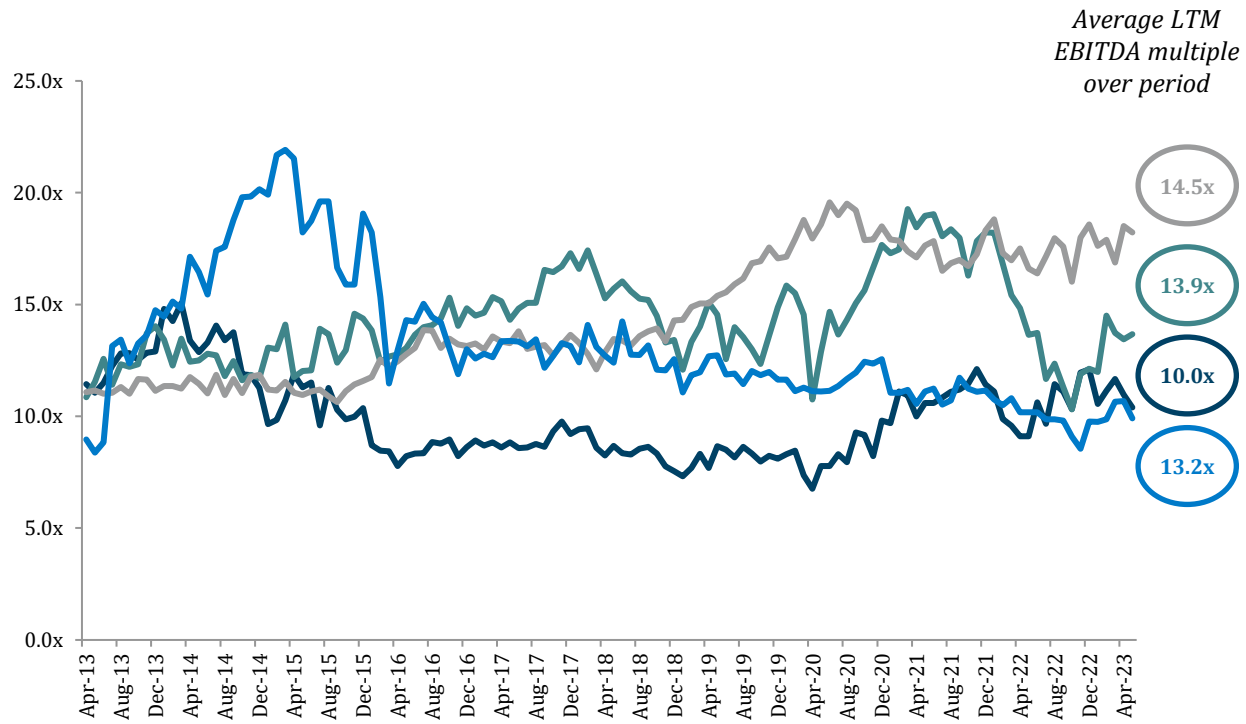
Announced Date	Buyer	Target	Asset Description	EV	EV/ Sales	EV/ EBITDA
01/2023	GI Partners	Atlas Technical Consultants Inc	Provider of professional testing, inspection engineering and consulting services	1,016	1.6x	13.9x
01/2023	Xylem	Evoqua Water Technologies Corp	Provides water and wastewater treatment systems and technologies	7,039	4.0x	27.3x
12/2022	PGGM, DIF Management	Saur SAS	Provider of water treatment and recycling services	1,117	1.8x	-
12/2022	SKion Water	Enpure Limited	UK based company engaged in the provision of process engineering solutions	Confidential		
08/2022	Essential utilities	Wastewater Assets East Whitehead	Municipal wastewater assets	55	-	-
08/2022	Solenis	Clearon Corp	Manufacturer of water chemicals for household and industrials uses	Confidential		
07/2022	KKR	Northumbrian Water Limited	Water utility / infrastructure in England and Wales	1,026	4.0x	10.0x
05/2022	SAUR	Veolia Environnement SA (Mobile water services business in Europe)	Provides mobile water services in Europe	200	8.6x	-
12/2021	FCC Aqualia	JSC Georgia Capital (water utility business)	Water utility provider in Georgia specialising in EPC work related to municipal projects	180	7.3x	-
08/2021	Kyushu Electric Power	Al Dur Power and Water Company	Bahrain-based company engaged in energy and water production	Confidential		
07/2021	Beijing SPC Environment P rotection Tech	Sichuan Development Guorun Water Investment	Provides industrial water treatment, engineeri ng design, construction, and operation service s	746	8.3x	13.6x
06/2021	Pennon Group	Bristol Water	Provides water supply services in the UK to approximately 1.2 million people in Bristol	1,151	9.1x	15.6x
02/2021	City of Tallinn; Utilitas Energy	Tallinna Vesi AS	Estonia based company engaged in the supply of water and treatment of wastewater service in the city of Tallinn	173	6.3x	11.7x
09/2020	Antin Infrastructure Partners	Miya Water	Offers water loss management solutions to municipal water utilities	423	-	14.3x
09/2020	SK Engineering & Construction	EMC Holdings Co	South Korea-based holding company for env ironmental services and wastewater tr eatment	886	2.7x	14.5x
				Median	**4.1x**	**13.6x**

Sources: Mergermarket, CapitalIQ, BDA Partners

Our view on water M&A and valuation (3/3)

Listed water company comparable analysis

Non-exhaustive, selected only. EV/LTM, April 2013 to April 2023, as per Capital IQ



Key and comparable set:

Western water utilities

California Water Service Group
American Water
Essential Utilities
Middlesex Water Company
Pennon
Severn Trent
Consolidated Water
United Utilities
SJW Group
York Water
Artesian Resources
American States Water Company

Engineered water products

ADS
DuPont
Mueller
A.O. Smith
Xylem
Pentair

Water chemicals

Ecolab
Kemira
Kurita

Water EPC & Consulting

Tetra Tech
北控水務集團有限公司
北京首创股份有限公司 Beijing Capital Co., Ltd.
Organo
Wabag

Q&A with BlueTech Research

BDA has collaborated with BlueTech Research to provide further, proprietary views in the water space. Below are some key insights into trends and investment opportunities in Asia:

BDA: The impact investment thematic is seeing significant capital flows from across the world, with water increasingly becoming important. Asia is home to 60% of the global population and has strained water resources due to economic growth and rapid urbanization. What trends are you seeing in the Asia Pacific region in respect to water investment?

BlueTech: Whereas North America and Europe are often bound to the infrastructure and cultural mindset that has been in place for the past fifty to one hundred years, the Asia Pacific region provides governments, technology providers, and investors with a blank slate for innovation. This is already playing out in major ways.

First, consider infrastructure investment. Municipalities looking to install their first wastewater treatment plants have many innovative options to consider. Take the uptake of Membrane Aerated Biofilm Reactor ("MABR") technology, an alternative biological treatment method to conventional activated sludge that reduces concrete and energy requirements. The concept for the MABR was born in Europe; however, the technology first proliferated in the Asia Pacific region, predominantly China, where municipalities used decentralized MABR units to meet new nutrient discharge regulations.

"The Asia Pacific region's approach to water investment is forward-thinking, leverages innovative technologies and reimagines societal attitudes towards wastewater"

Second, consider the cultural mindset around wastewater. Water scarcity has forced countries in the Asia Pacific region to reconsider the very meaning of the word. Take Singapore, a country with no natural waterways that was largely dependent on water imported from Malaysia at the time of independence in 1964. Today, treated wastewater is converted to what the country has branded "NEWater", which meets 30% of the country's demand. When our CEO, Paul O'Callaghan, visited the Bedok NEWater treatment plant back in 2011, he compared it to Disney World; the plant is fully interactive, and school children visit the plant daily. Drinking NEWater is cool and trendy.

Overall, the Asia Pacific region's approach to water investment is forward-thinking, leverages innovative technologies and reimagines societal attitudes towards wastewater. By capitalizing on this momentum, the region has the potential to pave the way for more sustainable water management practices globally. That said, one must be certain to get the contract and business model right. It's clearly an exciting time to be in the water and wastewater sector!

Q&A with BlueTech Research

BlueTech's 5 key predictions that will transform the water space in the next 5 years:

1. **Return to solutions developed by nature,** where solutions such as "sponge cities" (as seen in China) will reach an inflection point (e.g., managing stormwater and water scarcity).
2. **Economic nationalism will open new opportunities** for water technologies and service providers, **as water supply chains are on-shored.**
3. The definition of **wastewater will be re-defined globally as we deal with water and resource scarcity** – as wastewater holds untapped resources, thermal and chemical energy, rare earth elements, metals and nutrients.
4. **The value of water will change drastically,** requiring a **multi-stakeholder approach** resulting in the public and private collaborating in new ways.
5. ESG pressures, carbon taxes and policies **will accelerate uptake of technologies that reduce energy consumption and emissions** associated with water and wastewater treatment.

BDA: There is incremental and transformative innovation – with the latter increasingly becoming a focus considering freshwater reserves are running dry. What technologies does BlueTech see at the forefront of innovation in the water space, and which are most likely going to be democratized in Asia?

BlueTech: MABR technology is one technology that we have seen become democratized in the Asia Pacific region. Sponge cities are another. Generally, when it comes to wastewater treatment, technologies that provide capital and operating cost benefits compared to conventional treatment methods have a great opportunity in Asia.

To address water scarcity, while sponge cities can help cities better retain stormwater, collected water still needs to be treated to be reused. Here, look to membrane and disinfection technologies. In some instances, these may be better packaged in a membrane bioreactor configuration to treat stormwater and wastewater at the commercial building or small community level. Ceramic membranes are one technology that we could see further democratized in the Asia Pacific region following this trend (alongside the opportunity for industrial wastewater treatment and re-use).

Q&A with BlueTech Research

BDA: There are many investors looking to make acquisitions in the water space, but there is a scarcity of targets. What are your views on the water M&A landscape and how this will develop going forward?

BlueTech: Acquisitions of companies with differentiated technologies, business models, or combinations thereof will continue to be expensive. Strategics and private equity firms are competing fiercely to buy up market leaders. COVID stimulus efforts facilitated cheap money, prompting strategic water players to make aggressive bids, and attracting more aggressive participation from private equity groups. Although cheap money has ceased in the last 18 months, average prices continue to surpass pre-COVID levels. To put prices into context, compare the acquisitions of GE Water by SUEZ in 2017 and EVOQUA by Xylem in May of this year. The GE Water deal was valued at 12.5x EBITDA, while the EVOQUA deal was valued at 27x EBITDA. The sweetheart multiples of yesterday are average multiples today, and we see no sign of a return to normalcy.

"Strategics and private equity firms are competing fiercely to buy up market leaders"

About BlueTech Research

BlueTech Research is the world's leading advisor for water sector commercial due diligence. Areas of support include:

- ✓ Identification of acquisition opportunities
- ✓ Evaluation of traditional & cutting-edge technologies
- ✓ Techno-economic competitive analysis
- ✓ Evaluation of business models & corporate structures
- ✓ Analysis of market trends, challenges and sizes
- ✓ Revenue forecasting & financial analysis
- ✓ Post-acquisition strategy development

BlueTech also hosts an annual global water technology conference, bringing together leaders in the water market. This year's event with over 250 attendees - including BDA Partners - was hosted in Edinburgh, Scotland.

Contact details

Dr. Paul O'Callaghan, *Chief Executive Officer*
Paul.OCallaghan@bluetechresearch.com

Conrad Hopp, *Senior Research Analyst*
conrad.hopp@bluetechresearch.com

BlueTech RESEARCH

www.bluetechresearch.com

Concluding remarks

The problems that exist around the reliable supply of clean water and water treatment are vast, with decades of global underinvestment creating literal leakages in the system. At the same time, extreme weather conditions and an ever-growing population are draining reserves and contribute to growing demand for water. Solving these challenges will require investments in capacity (both incremental and refurbishment) and deployment of new and superior methodologies. In response, both governments and the private sector are committing significant amounts capital. Simultaneously, new and improved treatment technologies are emerging. As a result, there is a strong flow of exciting investment opportunities and a wave of transaction activity in the market.

Each region faces its own water challenges, with North America and Europe suffering from ageing infrastructure and contamination from chemicals like PFAS. As a result, aerobic and anaerobic technologies to treat pollutants, as well as PFAS destruction technologies are seeing growth. In the Middle East in particular, new capex-competitive innovative ceramic membranes are increasingly being adopted, challenging the incumbent polymer membrane solution. Across APAC, natural solutions like sponge cities are built, as well as a strong uptick in Membrane Aerated Biofilm Reactor technologies.

Despite the capital inflows and growth, attractive mid-sized assets in the water sector are scarce and command a premium valuation. Smaller water technology players are often acquired by larger incumbents before reaching significant scale, or by private equity firms that look to build platforms of multiple smaller water assets. Large water companies themselves are seeing consolidation. At BDA we see significant growth investment in the sector that will, in the near term, create attractive sizable opportunities. We look forward to partnering with you to help realise your goals.

Contact us - BDA Sustainability team

Our Sustainability practice acts as a bridgehead for the sustainability and ESG ambitions of our clients. We leverage our global network and expertise to deliver best-in-class results for businesses contributing to the energy transition and decarbonisation of the economy. BDA Partners has closed eight deals in the sustainability space in 2022 alone.

Mark Webster
Partner, Head of Singapore, Head of Services
+65 6958 1202
mwebster@bdapartners.com

Lars Freitag
Partner, Head of Sustainability (Infrastructure & Services)
+65 6958 1213
lfreitag@bdapartners.com

Nils Weng
Associate, London Sustainability team
+44 7506 618 152
nweng@bdapartners.com

B|D|A
PARTNERS

NEW YORK
1270 Avenue of the Americas
Suite 2901
New York, NY 10020,
United States
Tel +1 (212) 265 5300

LONDON
2nd Floor, 17 Waterloo Place
St James's
London SW1Y 4AR
United Kingdom
Tel +44 (0) 20 3327 3360

MUMBAI
B-902, One BKC, G Block,
Bandra Kurla Complex,
Mumbai, Maharashtra 400051
India
Tel +91 (22) 6140 3800

HO CHI MINH CITY
Level 19, Deutsches Haus
33 Le Duan Street, Ben Nghe Ward
District 1, Ho Chi Minh City,
Vietnam
Tel +84 (28) 3620 8806

SINGAPORE
50 Collyer Quay
OUE Bayfront, #08-01
Singapore 049321
Singapore
Tel +65 6958 1200

HONG KONG
Suite 2002 20/F, 100QRC
100 Queen's Road, Central
Hong Kong SAR
Tel +852 3698 1700

SHANGHAI
HKRI Centre Two, Units 1704-1706
288 Shimen Road (No.1)
Shanghai, 200031
China
Tel +86 (21) 3217 8222

SEOUL
2F, Youngpoong Building
41, Cheonggyechoen-ro, Jongno-gu
Seoul, 03188
Republic of Korea
Tel +82 (2) 735 4220

TOKYO
27F Atago Green Hills Mori Tower
2-5-1 Atago, Minato-ku
Tokyo, 105-6201
Japan
Tel +81 (3) 3433 5800

June 2023

For more information, visit **www.bdapartners.com**