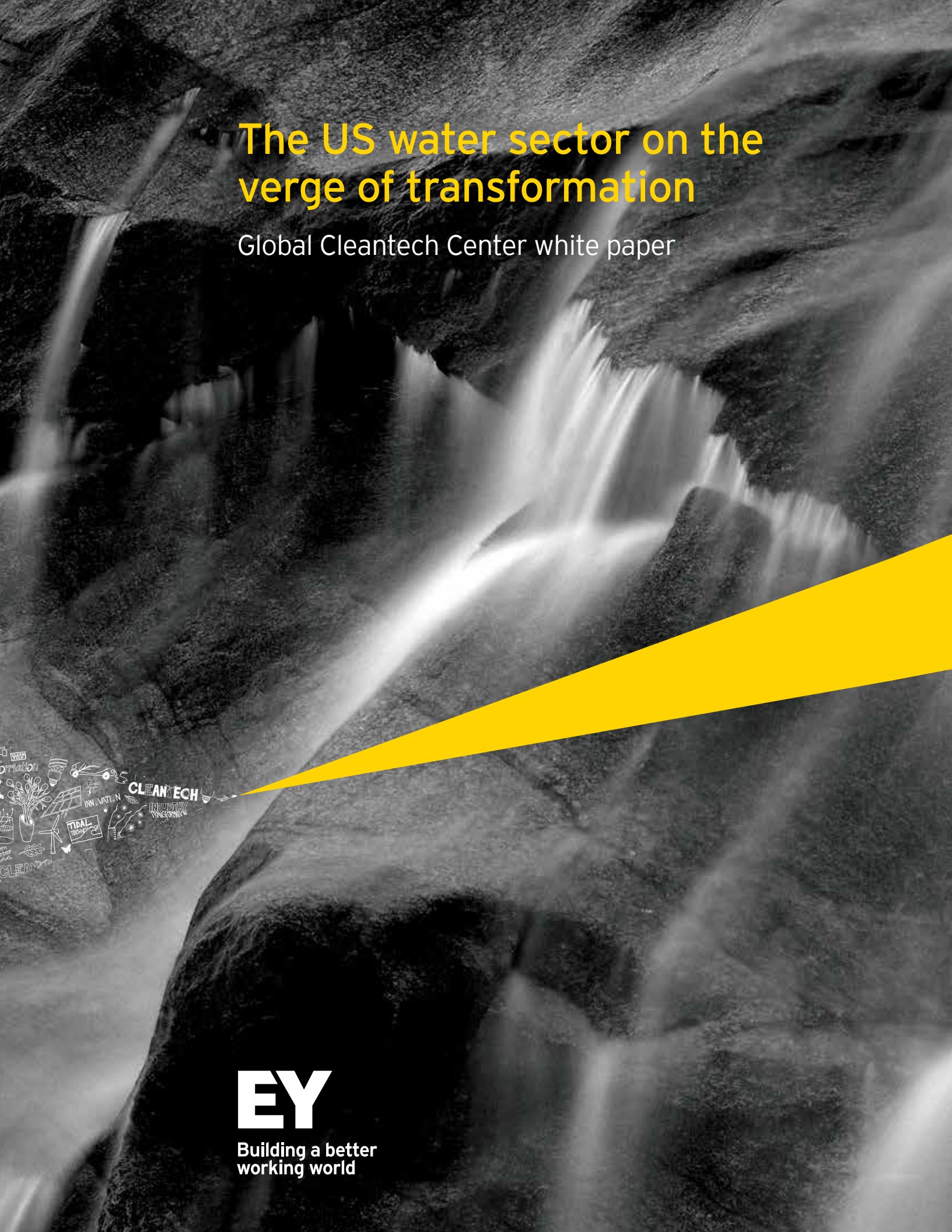
The US water sector on the verge of transformation

Global Cleantech Center white paper



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This publication was written in association with Eylon Javetz,
Simul Consulting Corp., contact@simulconsulting.com

Simul Consulting

Foreword

Change is brewing in the US water arena.

In-depth interviews with industry leaders paint a sobering picture of the present state of water sources, systems and businesses. Hopes for the water sector to produce "blue-gold"-like investment returns are damped by market structure growth constraints and major barriers to entry for innovators.

Decaying infrastructure and the related funding gap remain unresolved and underemphasized by politicians and rating agencies.

Professional risk aversion and the sway held by consultants over utility preferences have curbed the pace of system innovation.

Regulation has imposed substantial obligations and costs on operators, while at the same time leaving efficiency-focused measures voluntary and unenforced.

Utilities have lacked a sense of urgency to revamp managerial and financial practices. This lackluster approach stems from reliance on perceived water abundance, an ability to raise prices and continued capital availability through municipal bond markets.

However, with trying economic conditions, increasing climate volatility and inexorable infrastructure decay these decades-long practices may no longer be viable. It would seem that when it comes to national policy-planning, state regulation or utility-level management, change is coming by necessity.

In fact, as public, professional and political awareness of converging water challenges increases, there are growing signs of interest in solutions that have been proven to be effective — whether engineering, managerial, financial or technological — within existing systemic constraints.

Indeed, we see key sector participants developing new solutions, from adjusted pricing mechanisms and enhanced asset management, to consolidation and greater private sector involvement, to business model innovation and pockets of technological adaptation.

And while long-term financing alternatives are being explored by various government agencies, bringing the nation's water systems to the needed level of performance will require federal, state and municipal decision-makers to come together and formulate harmonized policies that boost institutional and market efficiencies.

In this context, all parties would benefit from greater quantitative transparency, standardization and fact-driven interagency work.

Accordingly, this paper points to multiple challenges that are converging to compel change in the US water sector. It highlights emerging trends and puts forward a series of proactive steps that water industry stakeholders should consider to help establish the long-term sustainability and growth of the sector.

We hope that this paper provides valuable insight into the water challenges before us and contributes to the growing discussion of how to address them effectively.

Gil Forer
Leader, Global Cleantech Center
EY

Christine Staub
Global Water Network Leader
EY

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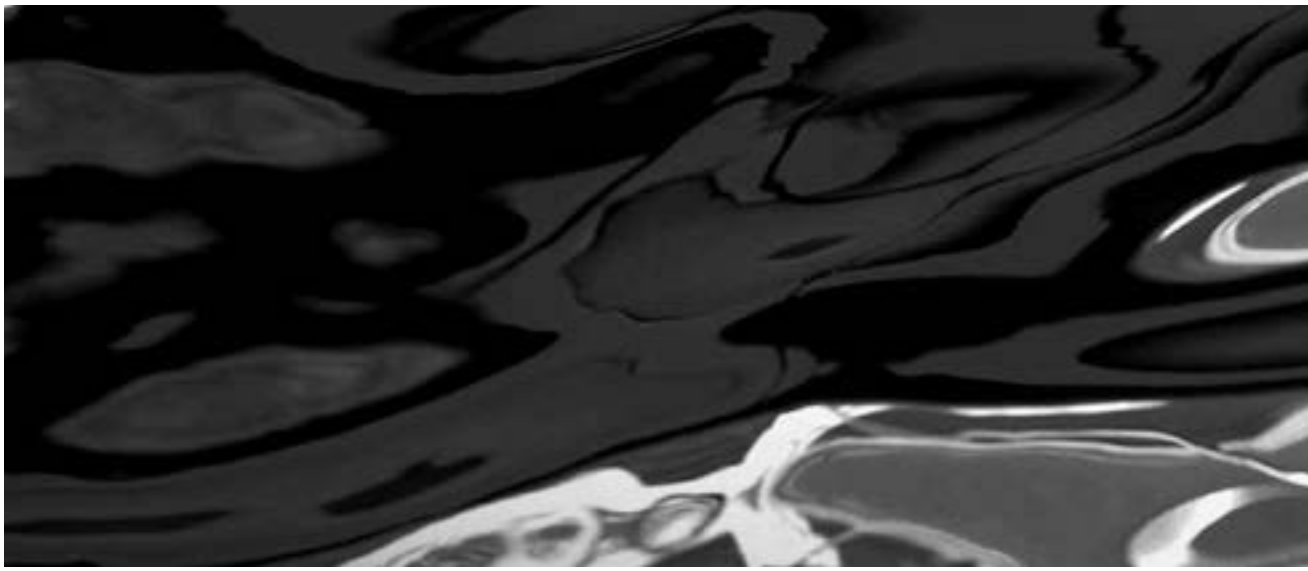


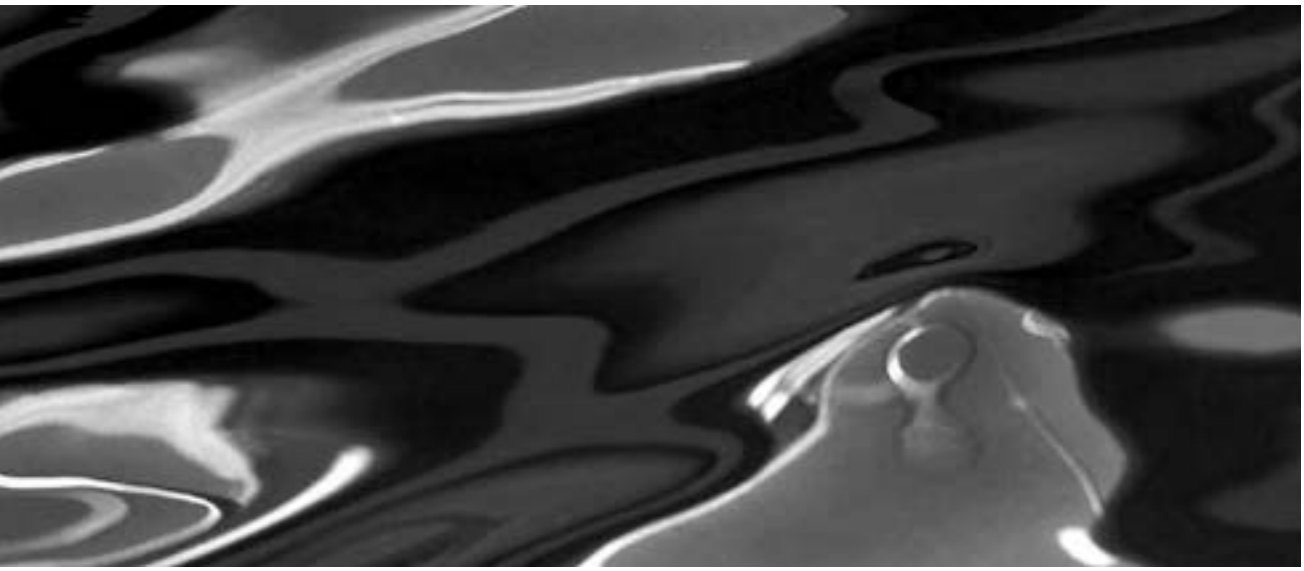
Introduction

The US faces several major water challenges, the impacts of which are beginning to be felt across industries: increasing water scarcity, aging infrastructure, climate volatility, water quality issues and rising water-related energy risks.[1] To address these immense challenges effectively, the water and wastewater sectors must address underlying structural and financial impediments that hamper the adoption of system innovation and efficiency-focused strategies.

Certain countries and US regions have succeeded in adopting and implementing advanced water and wastewater strategies. The best practices developed in these water markets have improved the long-term financial viability of water systems while decreasing water consumption and reducing pollution.

Such change has transpired where political and professional stakeholders have worked together to promote adoption of innovative market mechanisms, cutting-edge engineering practices and efficiency technologies, along with standards and regulations that enhance accountability.

The US has the potential to realize the benefits of these best practices on a national scale. Achieving this, however, will require engaging engineering, financial and political leadership to crystallize an actionable national water agenda, strengthen the mechanisms that mitigate sector fragmentation and deliver a supportive policy framework.



1 Economic downturn encourages new financing approaches

The US faces a water supply-demand imbalance that must be resolved, in addition to an unsustainable funding gap. Because water systems are reaching the end of their service lives across the US, an estimated US$1t in new investment is needed just to rehabilitate current water infrastructure over the next two decades.[3] New investment flows will be required to implement the necessary system expansions, mitigate the effects of climate volatility and secure new water supplies.

While funds allocated in the US federal stimulus program of 2008 played a small role in temporarily narrowing the funding gap, that source of investment is now exhausted. A large, consistent capital flow is needed. Delays in water system upgrades will result in higher social, health and environmental costs; loss of productivity; and higher costs for water projects over the long term.[4]

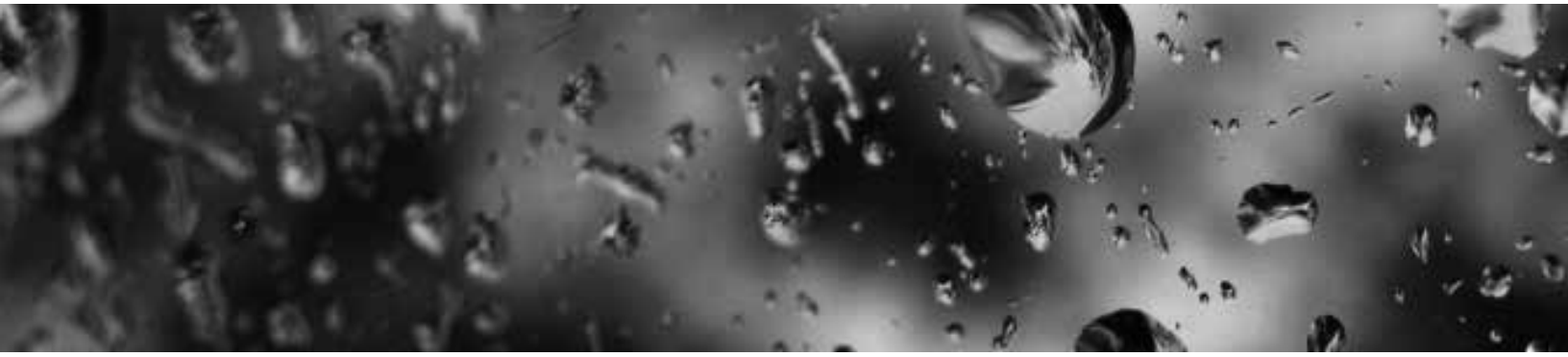
Unfortunately, the demand for such massive financing coincides with fiscal tightening at federal, state and local levels as a result of the ongoing economic downturn.[5] The situation is worsened by rising financing and commodity costs.[6] Where economic growth formerly provided short-term solutions to such long-term problems — for example, new connection fees funding water system operations in booming real estate markets — today's economic policies are expected to force hard decisions.

The convergence of indebted institutions experiencing harsh economic conditions and surging capital expenditure needs should spur change in the capital-intensive, risk-averse and highly fragmented US water sector. According to the United States Environmental Protection Agency, the US has more than 52,000 water systems, yet just 8% of these systems serve 82% of the total population.[7] With thousands of small community water utilities in the US, many with marginal economic viability, there is an opportunity — and above all, a challenge — to transform the water sector through structural changes that will provide greater efficiency, strengthen its financial position and unlock the necessary capital flows.

To catalyze this transformation, water companies, regulators and consumers must reconsider decades-old practices and look to repricing, investment in efficiency-focused systems and consolidation. Change must occur on multiple fronts, whether regulator, supply-side or demand-side driven.

Water utilities face multiple financial challenges

Water utilities continue to deliver reliable water supply despite increasing regulation, stagnant financing and mounting maintenance needs. However, budget constraints, in part resulting from restricted



margins and regulated pricing, and in part by the lack of political urgency and sector conservatism, have held back capital expenditure and research and development (R&D) investment. Many water utilities and municipalities have focused primarily on cost-saving tactics and critical refurbishment projects. Traditional low-cost solutions to infrastructure issues remain prevalent even when innovative engineering approaches and technologies have proven more effective in private industry and in overseas markets.

Water utilities have made every effort to maintain high bond ratings and benefit from the related savings, but adverse conditions may soon pose additional financial challenges and affect water utilities' credit worthiness.

While investors' "flight to safety" in the downturn has provided stable demand for bonds to finance water projects, it is questionable whether debt will stay as affordable and accessible to water utilities in coming years. What's more, US municipalities are still coping with the high levels of debt raised for other governmental functions and struggling to meet non-debt obligations. Municipalities whose credit worthiness is downgraded due to such factors as political resistance to raising water tariffs, high fiscal deficits and dwindling water resources may have difficulty selling water-related debt.

Bond pricing and ratings have yet to reflect declining water utility revenues resulting from gradually improving water conservation. Credit ratings have yet to adjust to growing bondholder and rating agency awareness of water risks because of climate change and increasing competition for limited water resources. Moreover, bond markets may not yet fully reflect substantial capital needs for infrastructure rehabilitation and higher expenses caused by increasing regulatory requirements. All these risks will become more apparent in the absence of the political will to invest heavily in water and set cost-based tariffs.[8]

Publicly traded utilities may be nearing a crossroad. Many US utilities have experienced considerable stock-price appreciation in recent years. This has increased expectations of further dividend yield hikes which may not be met due to rising operating and financing costs, as well as challenging economic conditions that impinge on these utilities' cash and debt. Should these conditions persist, the cost structure of certain water utilities could become susceptible to inflation. In addition, since utility revenue growth depends primarily on selling higher volumes of water, earnings and dividend yields are sensitive to reduced usage, whether the result of reduced economic activity or of conservation.

The convergence of indebted institutions experiencing harsh economic conditions and surging capital expenditure needs should spur change in the capital-intensive, risk-averse and highly fragmented US water sector.

Consequently, over the long term, US water utilities stand to benefit from focusing their attention on strengthening their financial positions, including restructuring and consolidating operations, improving financial planning, offering additional differentiating services to clients, reducing non-revenue water levels and increasing tariffs.

Repricing is under way

Water tariffs in the US have increased in recent years more than elsewhere in the world. According to Global Water Intelligence, the average combined tariffs in the US rose by 6.4% for the 12 months ending July 2012 while global tariffs rose on average by 3.6%.[9] The increase in the US is from a much lower tariff base, however. US water tariffs are approximately half those of Germany, for example, but because American consumers use about three times the water per capita as German consumers, actual household bills would be comparable.

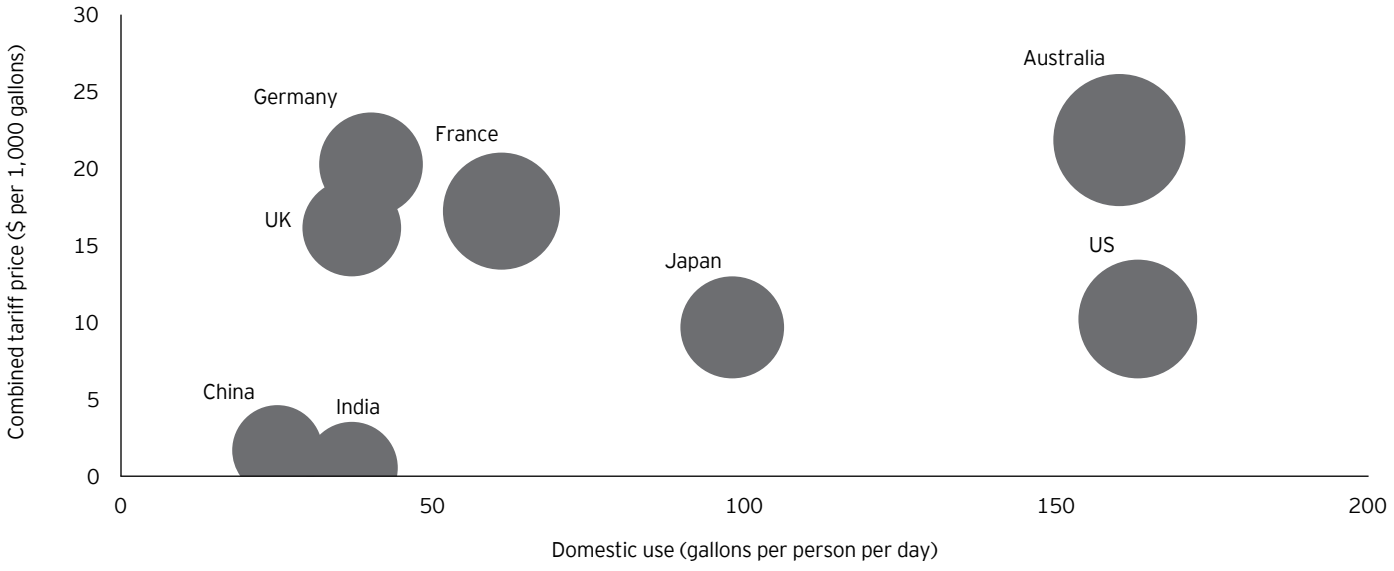
The US water industry is starting to advocate additional tariff hikes to manage rising costs, improve its ability to attract private capital and facilitate water conservation efforts.[10] Such hikes would continue a long-standing trend in many municipalities and help to heighten consumer awareness of cost recovery needs and water scarcity.[11] The increases would also help utilities sustain their revenue levels in the face of decreasing demand and allow them to maintain favorable credit ratings and access to municipal bond markets.[12]

Pricing models have shown a considerable degree of variability, reflecting the ongoing debates among stakeholders as they rebalance financial, political, conservation and operational considerations. While flat rates remain the most prevalent pricing structure in the US, tiered or block-rate structures that charge according to level of usage or type of customer have gradually become more common during the past decade.[13]

Some municipalities have also introduced scarcity rates, seasonal and time-of-use charges. In an effort to provide incentives for efficiency, water revenue adjustment mechanisms are used in some jurisdictions to reimburse utilities for lost revenue, and tax breaks are given for localized treatment. Further, charging for non-consumption benefits of water supply (e.g., tourism, transportation and such), applying discharge fees and creating differentiated grades of water are all pricing strategies being explored by various municipalities.[14] As the need for conservation becomes more acute, more widespread adoption of mechanisms to decouple utility revenues from volume of water delivered will be required.

While debate continues on the true impact of price increases on water consumption among the various segments of users, the key to an effective long-term pricing mechanism is finding the right balance among those who consume the most and those who are

Figure 1. Average water tariff and water use in select countries



Note: Size of the bubble represents the total annual amount of fresh water used to produce the goods and services consumed.

Source: Standard and Poor's Credit Week®: Special Report on Water, *7 March 2012, and Global Water Footprint Network*.

the most price sensitive, i.e., industrial, agricultural, energy and mining users.[15] However, the regulatory landscape has not yet evolved sufficiently to ensure transparency and equity in pricing among various users.

New approaches are needed to develop effective pricing. The current pricing framework was originally conceived to address supply but not necessarily consumption behavior. Moreover, weak pricing signals are still prevalent in many utilities. Some have argued that the economic interests of water utilities may lie with users who offer new revenue streams, such as the hydraulic fracturing industry which needs water and wastewater treatment, rather than with stakeholders who favor a supply-demand balance.[16]

Furthermore business interests and local development considerations often fail to fully price in sustainability values in the context of water scarcity. Nor do they account for the potential international trade-offs, cross-border economic benefits or water security risks as part of globalization — complex considerations that must become part of the calculus of pricing frameworks.

Awareness of the true economic value of water is gradually increasing, but current pricing models are still mostly based solely on operational and financial costs.[17] Data is needed to provide the inputs for a more comprehensive pricing model. One contribution will come from the Environmental Protection Agency Office of Water, which is due to release a report at the end of 2013 on the importance of water to the US economy.[18]

Need for efficiency will propel new pricing and engineering approaches

The decoupling of utilities' fixed cost recovery from the volume of water sold could potentially enable new investments in demand-side efficiency and conservation. With decoupling, utility revenues are based on a regulatory revenue target rather than on sales, with periodic rate adjustments to compensate for actual revenues that are above or below the target. By assuring that utility revenues will not decline as a result of efficiency measures, decoupling removes the incentive to promote higher-quantity sales and the disincentive to invest in both demand-side and supply-side conservation.

During periods of strong economic growth, utilities can make investments in consumer efficiency and conservation more easily because of strong revenue from consumption increases and auxiliary income streams like connection fees for new houses. However, while low growth lingers, financially stressed utilities cannot justify investments in demand-side efficiency that will only put further pressure on their revenue streams and worsen their financial positions. This is especially true in many of the water-stressed regions of the US, which need increased conservation but whose economies and housing stock are in contraction.

As state regulators institute water conservation measures, the true cost of water is reflected in pricing, and new infrastructure remains hard to finance, the water conserved will be recognized as more valuable than the water produced and sold. For this reason, the need for decoupling to enable greater demand-side efficiency is expected to grow.

Efficiency strategies could become more prominent should price decoupling go hand in hand with higher emphasis on long-term balanced-budget planning and the increased ability of municipalities to capture cost savings. A greater focus on efficiency may also be driven by changes in related bond rating and the ensuing reliance on issuance. In this regard, capturing long-term capital expenditure needs in bond rating, transparent ongoing monitoring of water resource levels in areas of scarcity, and improved water-audit practices that lead to regulated implementation of efficiency measures may help budgeting processes, facilitate fact-driven pricing mechanisms and bring about the desired efficiencies.

While decoupled rate structures for electric utilities have existed in a number of states for decades, in 2008, California was the first state to implement water decoupling for its investor-owned utilities. While reviews of California's experience to date have been mixed — owing to problems with the mechanism to balance deviations from anticipated sales revenue — the consensus is that such policies work. It will be important to learn from California's implementation of decoupling, as well as the broad experience with decoupling in the power industry.

New financing practices are emerging

Due to the decentralized nature of the water system in the US and the fact that government-owned utilities serve 90% of customers, financing through municipal bonds has been the primary method of capital raising in the water sector.[20] The municipal bond market continues to attract investors, yet with continued fiscal austerity in state budgets and tight credit markets, the availability of municipal bond financing going forward could be put to a test. Part of the test will be whether municipal managers will be willing to take on substantial amounts of new debt even if it is available, given the high state and municipal deficits.

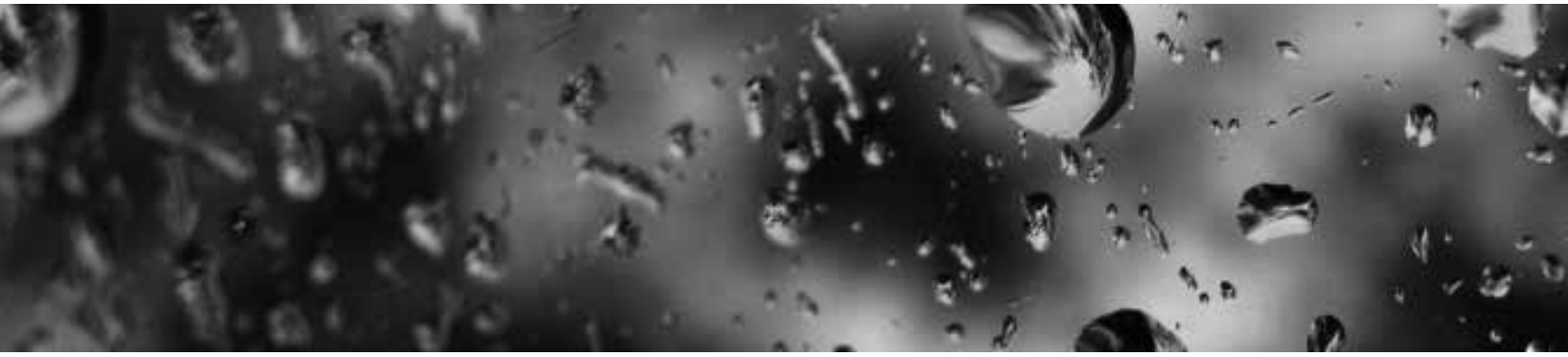
To meet their growing financing needs, some US utilities, municipalities and water companies have sought financial innovations that will allow them greater access to private capital to compensate for the shortfalls in public financing.

Promising financing options being explored include:

- Private activity bonds issued by or on behalf of local or state governments for the purpose of financing the project of a private user
- Special subsidized bonds, such as Build America Bonds, municipal bonds subsidized by the federal government
- Financing from infrastructure equity funds
- Water-focused loans from federal government entities
- Investments from state revolving funds[21]

Steps are also being considered to improve access to debt, such as providing government loan guarantees and related insurance options to improve credit ratings. Other means to encourage investors into the water market have been the use of revolving funds or bond banks to group together a large number of small borrowers and assign a collective credit rating. The primary objectives of financing water have been to reduce the transaction costs per deal and improve the information and transparency of the borrower's credit risk.[22]

These financing options are meant to expand the number of market participants and types of securities beyond the municipal bond market and to improve the awareness and attractiveness of water infrastructure projects for new private investors. Given the attractiveness of water as an undervalued resource, a growing private investment community is starting to evaluate the overall US water market beyond a particular state's or municipality's default risk. Instead, these investors are assessing regional supply and demand drivers, pricing changes, long-term resource planning and revenue scenarios adopted by water utilities and water companies. As a result of this growing investor knowledge base, certain financing options could encompass revenue-generating demand-side, as well as supply-side, transaction structures, activities and technologies.



Potential for public-private partnerships (PPPs)

Given the vast funding gap for water infrastructure, public funds may simply not suffice. Municipalities under financial stress are more inclined to monetize the value of their water systems in view of their limited ability to increase overall municipal revenue. Private sector participation is therefore expected to gain further momentum as fiscal tightening continues, particularly in regions that suffer from severe water stress and require increasing water production capacity. There are already more than 2,000 community water or wastewater facilities across the US that are designed as PPPs, ranging from large design-build-operate projects to small facility operations or shared functions in administration and billing.[19] But there is potential to further develop and improve PPP arrangements.

Learning from a long and mixed record of private sector involvement in the water arena, corporations and public agencies are standardizing PPP contracts and policies and improving on the partnership structures to foster cooperation, offer flexibility and ensure accountability. To manage competing needs and allow for contingency operations, the parties in water PPPs have adopted performance-related contracts and conflict management mechanisms. Moreover, the partnerships deliver additional transparency and detailed metrics that are critical to managing sector-related risk.

In a period of increasing financing costs, rising resource prices and a reduced risk appetite, public-private arrangements allow for a degree of fiscal stability, measurable returns and shared risk. This in turn has led both private and public stakeholders to consider flexible tariffs and the adoption of innovative technologies.

Bringing private sector knowledge, resources and efficiencies to water on a large scale will mean creating supportive policies and streamlining participation mechanisms. The best practices of PPP units at the national and regional levels in Australia, Canada and the UK can provide key examples of policy frameworks and standardized processes that have accelerated PPP activity in the water sector. Additional approaches that may also help bring greater private sector participation into play and mitigate public sector budget constraints in the US include joint public-private trusts and performance-based contracts, which are currently being tested in some markets.

Given the vast funding gap for water infrastructure, public funds may simply not suffice.

Institutional investors explore water-related allocations beyond public equities

In the economic turmoil of recent years, increasingly risk-averse institutional investors, such as pension funds, have focused on non-cyclical sectors. Water is gaining traction as an alternative investment because water investments are often non-cyclical and are not correlated to the broader public debt and equity markets. Institutions are looking at a broad range of water investment vehicles beyond public equities, including green bonds, project financing and water-rights trading. According to Bank of America Merrill Lynch, state and local water and sewer bonds returned 4.59% in 2011, outperforming the broad range of municipal debt by 0.36 percentage points.[23]

As water-related regulation, tax incentives and government guarantees evolve, alternative investments in water may become even more attractive to institutional investors. However, such alternative investments require institutional investors to further develop expertise in related regulatory and financial issues that vary by state and locally.

2 Catalysts for consolidation

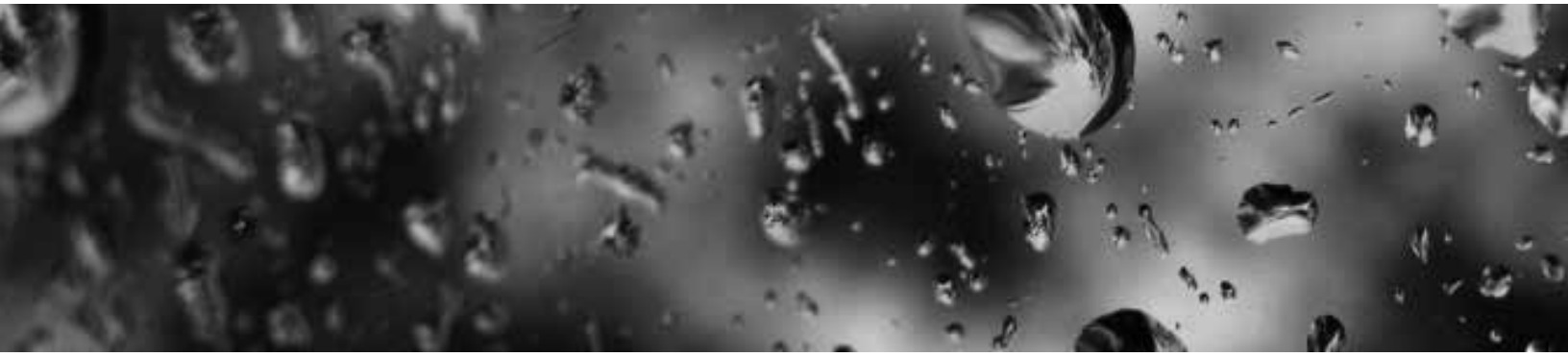
Water companies have increasingly turned to consolidation and partnership strategies in the wake of the economic downturn as they grappled with stringent capital expenditure plans and diminished investor risk appetite, coupled with higher debt costs and a risk-averse equity environment. Smaller public companies experiencing stock price and trading volume volatility are seen as attractive acquisition targets, while water utilities may be appealing to the value-seeking investor in light of restructuring opportunities that can add yield through improved operating efficiencies and site consolidation.

Reported merger and acquisition (M&A) activity rose in 2011, totaling US$12.7b in 55 deals, up from roughly US$900m in 40 deals in 2010.[24] Characterized by few but large deals, acquisitions have been an important growth strategy among water utilities and chemical water treatment companies. Given their regulated margins, water utilities have used M&A as the tool to achieve economies of scale and build value. Consolidation has also occurred among middle-market original equipment manufacturers seeking to grow from single technology providers to system providers. Larger corporations are working with a wider array of smaller equipment and treatment companies through joint ventures and partnerships.

Consolidation has also taken place when new industry standards are set or industries face new environmental regulations.[25] For example, acquisition activity has increased in the gas shale water treatment and smart water meter technology sub-sectors. This type of consolidation helps the market reach a critical threshold, allowing water companies to establish a global presence and technology companies to offer more integrated solutions.

Strategic acquisitions play a key role in sector growth

Large corporate water equipment manufacturers (e.g., GE, Xylem), engineering firms (e.g., Black & Veatch) and service providers have all combined organic growth with strategic acquisitions. As the number of international water companies continues to increase and competition intensifies, strategic acquisitions are expected to remain an important growth path for the industry. It is worth noting that some parts of the water divisions within large conglomerates have not fared as well as others and have themselves become targets of strategic acquisitions.



Greater consolidation is also taking place within pockets of the US water utility sector where the market has shifted to a more competitive dynamic. Where there have been market-based tariffs or demand-side activities, private companies have been able to partner or provide financing.

Neighboring small and midsize municipalities in the US are also forging partnerships to achieve economies of scale and mitigate rising costs. Working together enables municipalities to share resources, leverage shared infrastructure, access financing options together and improve their collective purchasing power. This trend is likely to accelerate.[26]

A role for private equity

Private equity is an important potential source of capital for the water sector that could drive consolidation, efficiency and new investments in technology and infrastructure.

Indeed, water sector investments offer private equity funds numerous potential benefits, such as capital preservation in a defensive holding, upside through technology innovation, value creation through consolidation and break-out companies in the sector due to the water demand-supply imbalance.

Nonetheless, private equity acquisitions in the US have been relatively limited.

This is partly because of the fragmented and localized nature of the water business, which requires a high degree of local customization that reduces profits and inhibits scalability. It is also a result of the sector's high fixed costs, major project financing requirements, long investment periods, inelastic demand and restricted margins.

Many midsized water technology companies sell non-differentiated products and services. Consequently, they face intense competition from a variety of players and lack significant growth prospects of the kind that would attract private equity funds. Conversely, water companies that do possess strong proven products and significant market share usually are not for sale or are offered only at exceptionally high valuations due to competition among strategic investors.

Privatization and deregulation in certain markets, such as Brazil, are providing private equity investors with new opportunities to "buy and build out" strategic water companies.[27] Private equity investors in the water sector may be well positioned to articulate the business need and financial case for regulatory changes that foster improved water services.

Private equity investors have recently appeared as important players in US PPP deals, such as the arrangement in which the City of Rialto, California, granted a 30-year concession for the operation of its municipal water and sewer systems in return for an initial payment of US$35m and US$41m in infrastructure upgrades.

Such dynamics may become more common in the US, depending on valuation trends and economic need, as well as changes in the regulatory climate.

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3 A stronger innovation ecosystem needed

Venture capital investment in the US water sector has increased in recent years, but investment remains small compared to the overall market size. For example, according to Dow Jones VentureSource, US$120m in venture capital was invested in water companies in 2012, representing just 0.4% of total US venture capital investment. There is an innovation funding gap in water as well.

Over the past decade, the venture industry has made headway in developing the specialized water industry knowledge needed to invest successfully. Venture capital firms investing in water include funds such as Element Partners, Emerald Technology Ventures, Energy Technology Ventures, Liberation Capital, Meidlinger Partners, Draper Fisher Jurvetson and Chrysalix Energy Venture Capital as well as a number of angel investor groups. Several corporate venture funds and corporate development units of large corporations have taken strategic positions in water over the same period.

Venture capital investments have focused primarily on technology and service opportunities, such as smart water technologies, waste processing, distributed reuse, desalination and ultrafiltration, as well as water services in gas, oil and mining. Most venture capital funds, including green funds, that have invested in water sector companies have only one or two such holdings in their portfolios.

A small number of venture capital firms dedicated to water investments have begun to operate globally, with several new ones working toward launching their first funds. Most of these water-dedicated funds are relatively small in terms of assets under management. Moreover, their activities are spread across multiple water sub-sectors and markets, which can diminish their impact.

With only a small number of firms focusing on the sector, there has been relatively limited competition among new venture capital investors as compared with other industries. The low level of interest in new water enterprises, narrow set of attractive opportunities and limited scope of exit options propel start-up entrepreneurs to focus on specific market needs, such as cost-cutting technologies that increase efficiency or well-defined problems identified by water authorities and corporations.

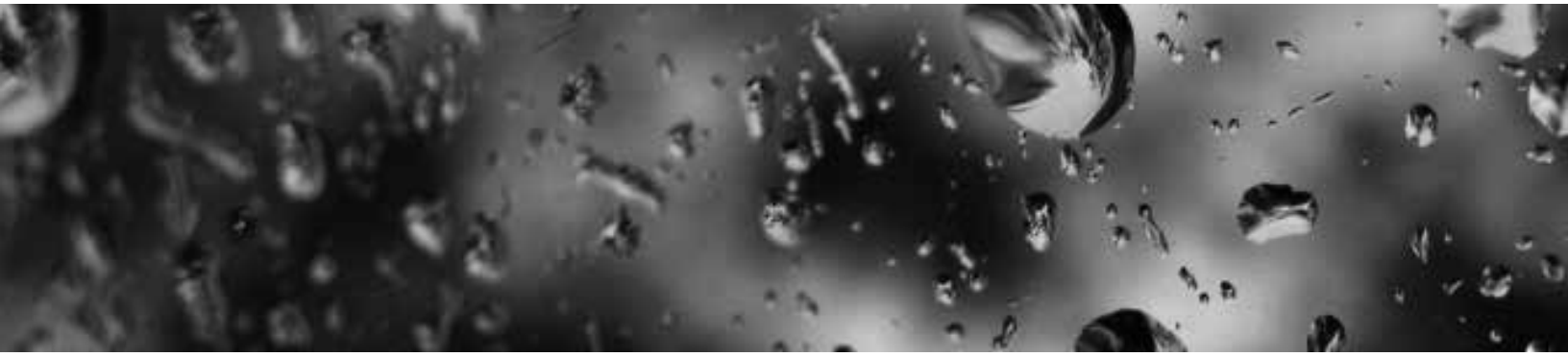
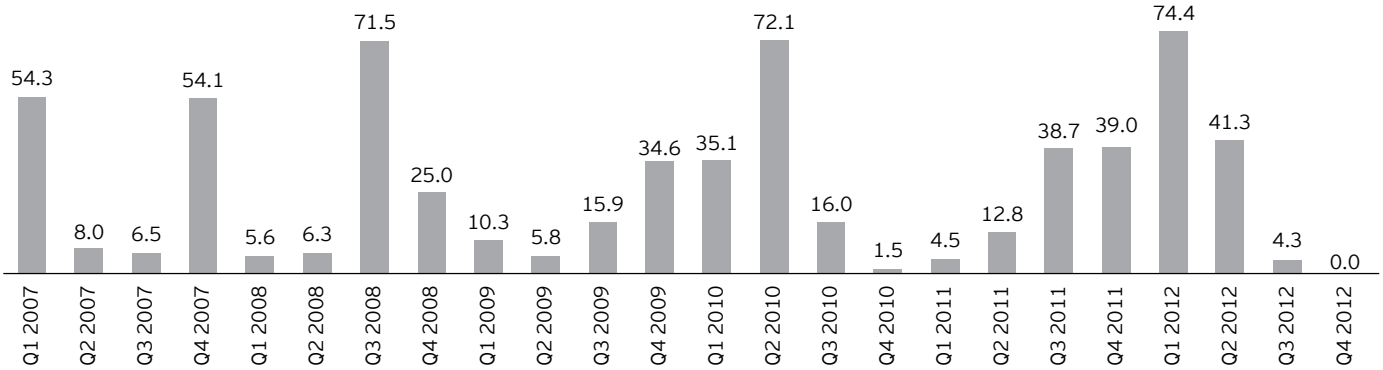


Figure 2. US venture capital investment in water companies (US$m)



Source: Dow Jones VentureSource.

A number of factors restrain venture capital investment in the sector. Start-ups face regulated utilities and water businesses that have traditionally refrained from assuming innovation risk. As a consequence, start-ups must persevere through a long sales cycle, many months of trial installations and subsequent reviews. This long road to return on investment requires considerable capital and affects valuations and exit opportunities accordingly. In an already difficult venture capital market, water technology companies are at a competitive disadvantage. Compared to other start-up markets, such as biotech, tech or energy, there is still no "customary" broad participatory process to qualify and finance companies from seed stage to initial public offering (IPO) in the water sector.

Historically, R&D and engineering efforts have rarely yielded groundbreaking disruptive water technologies. Even fewer inventions have been tested and proven to offer reliable performance, cost-cutting and simple integration with existing systems. In addition, the fragmentation across geographies, authorities and technological standards prevents effective scale-up. As a result, small innovative companies often find themselves struggling to establish the breadth of products, distribution channels and technical support to compete effectively in both the municipal and the industrial arenas.

Start-ups face regulated utilities and water businesses that have traditionally refrained from assuming innovation risk.

New models emerging

The challenges in financing water innovation, however, also create interesting business opportunities and innovative practices:

- New business models are being introduced to the market in which the start-ups and small companies assume the financial risk and installation costs in order to persuade price-sensitive customers of cost-cutting benefits as they try new technologies.
- Smaller companies are merging or forming early-stage joint ventures to offer the market more integrated solutions rather than stand-alone products.
- Platform companies are formed to float multiple new products, offering capital and expertise to pre-revenue start-ups or joint robust sales and support capabilities.

Further, a set of opportunities may be found on the intellectual property (IP) front, where a rich "graveyard" of IP has formed, consisting of patents and even complete products that have been tested but never reached critical mass commercially.

Corporations increase their involvement with early-stage companies

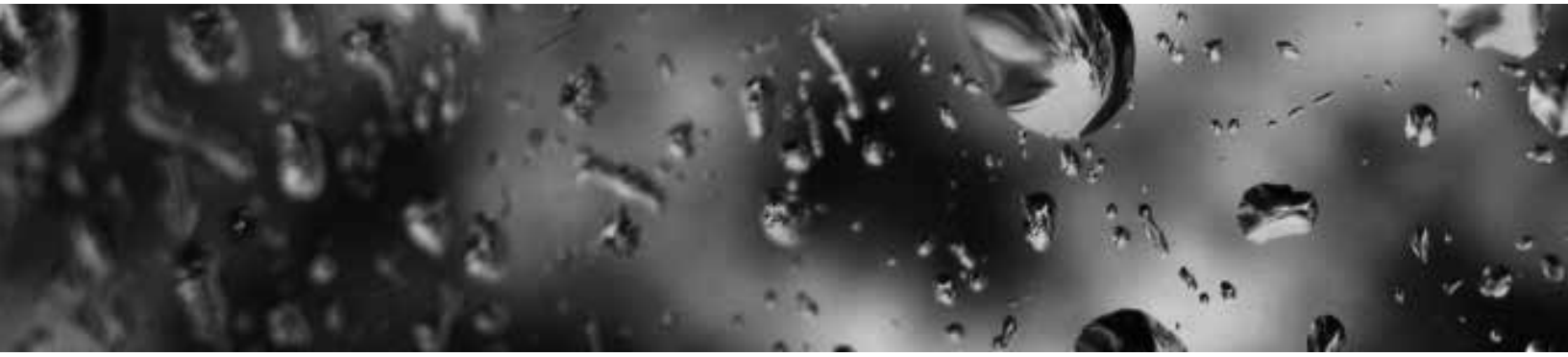
In the same way that pharmaceutical companies bolster their product pipelines by partnering with biotechnology companies, large water corporations are increasingly facilitating and financing external innovation in water technologies through relationships with emerging companies.

Multinational water corporations maintain innovation programs that enjoy global reach and enable the development of new businesses from R&D through testing and commercialization. The mission of corporate innovation programs frequently includes scouting for cutting-edge technology companies for potential corporate venture investments where the technologies are relevant to their growth strategies. This process enables large corporations to maintain technological leadership while lowering risk in early-stage technology development.

Water utilities have also established in-house innovation functions and built alliances with other utilities to select, finance and coordinate R&D projects. However, such corporate innovation functions are still few and far between in the US market. Some utilities have also come together through public policy alliances such as the Water Innovations Alliance. Establishing inter-utility platforms to test new equipment and exchange related information could offer significant water efficiency and economic benefits and could encourage regulators to be more receptive to new technologies.

Government incubation plays an important role during early stage

In the absence of sufficient market-driven processes to support early-stage development, some municipal and state governments have chosen to actively support water innovation through financial incentives, incubation facilities, demonstration sites and even backing for



commercialization. To this end, dedicated coordination and financing organizations have been created, as have water technology hubs.[29] In some regions, R&D funding by such organizations exceeds private sector investment in technologies at the earliest and riskiest stage of development. Globally, government support is strongest in countries with high water demand and scarcity. In the US, government support for technology development has recently emerged in Milwaukee, Cincinnati, Philadelphia and Massachusetts.[30]

To secure effective commercialization of the resulting technologies, coordinated efforts will be needed to harmonize favorable regulation across states, identify the high-priority challenges to which the industry is seeking new solutions, and sponsor collaborative platforms that help bring new products to the market.

Large water corporations are increasingly facilitating and financing external innovation in water technologies through relationships with emerging companies.

4 Transparency and quantitative management gaining importance

Stakeholders across the water sector, including those who use significant volumes of water, have voiced the need for better measuring and reporting on water supply-demand trade-offs (known as "quantitative management").

The absence of standard measures and transparency in consumption patterns and costs undermines cross-basin and cross-sector cooperation, holding back effective water governance. The industry has found it difficult to develop quantitative accountability, management and planning.

Moreover, water accounting lacks common standards and practices and very little is reviewed by independent third parties. Even in states where water audits are taking place, there is also no mandate that audit findings be acted upon.

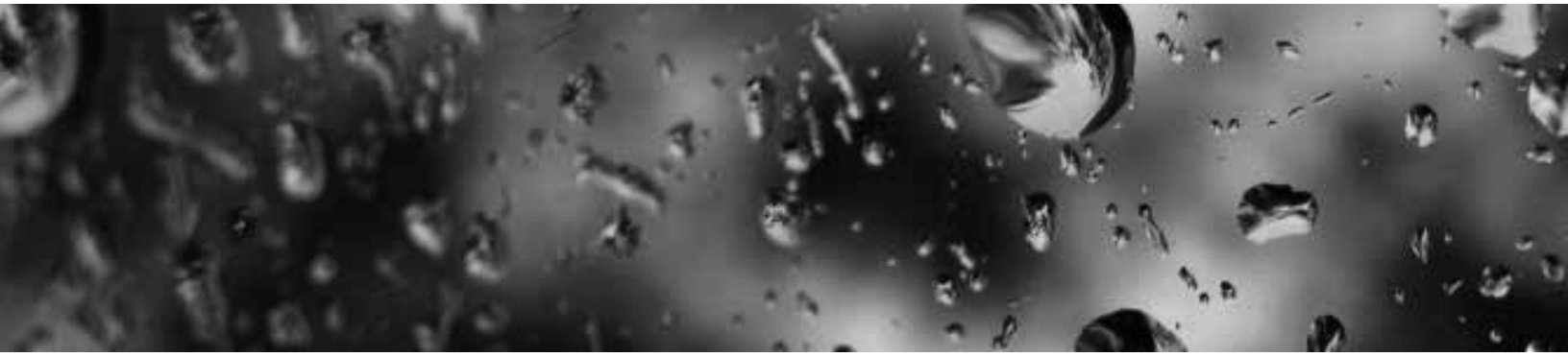
At the same time, asset management programs all too often remain mostly desktop plans focused on capital expenditures but lacking the field verification and avoiding the system reconfiguration that are customary in non-revenue water programs in other areas. Consequently, many utilities and water-intensive businesses have operated at sub-optimal efficiency levels.

Capital expenditures heighten need for quantitative management

Major capital expenditures for US infrastructure rehabilitation will heighten the need for a substantially higher level of quantitative management and data granularity. A growing number of nongovernmental organizations now provide water stewardship reports, water footprint measurements, water risk management frameworks and disclosure mechanisms to major cities, often with the sponsorship of large corporations.[31] At the same time, local water authorities and municipalities are developing their own in-house measurement criteria and databases to include varying parameters and levels of detail. Unfortunately, despite these efforts, many municipalities do not possess a current, detailed, holistic and actionable analysis of the state of their infrastructure assets. Additionally, the individualized nature of many of these initiatives limits the ability of operators and policy-makers to benchmark systems and regions.

Major capital expenditures for US infrastructure rehabilitation will heighten the need for a substantially higher level of quantitative management and data granularity.

Pressure to improve this state of affairs will mount as key stakeholders come to realize the costs of inaction in view of water scarcity and the difficult investment climate. Furthermore, as water utilities require higher tariffs, regulators and customers are likely to ask for better operational transparency, service upgrades and a clear rationale for price hikes.



In the industrial sector, water-intensive businesses have made investments to ensure that water considerations are integrated into operations and risk management.[32] Companies are implementing water strategies to manage rising resource costs, mitigate increasing risks and comply with stricter regulation.[33] Such practices meet regulatory requirements and budget needs and provide for business continuity and sustainability. They also respond to growing investor awareness of water risk and help protect brand reputation. Even in the industrial arena, however, opaque data related to water use and risk is still the rule rather than the exception. Companies too often lack a comprehensive picture of indirect water consumption that includes post-use, energy generation, supply chain footprint and long-term plans.

While measurement, reporting and governance models must be adapted to local needs, a common language must be developed to address key accounting and management of water as a resource. With dozens of standards for water use disclosure and footprinting developing simultaneously, the challenge is to establish the common benchmarks and comparable metrics necessary to drive efficiencies across all water users and facilitate knowledge exchange. Greater harmonization of standards and consistent model testing are needed to fix best practices and to allow for cross-sector sharing of data and transparency on the value of water.

A demand-side transformation is emerging

New technology systems enable better measurement and help standardize quantitative management of water systems. Conservation efforts and demand-side management initiatives have yielded considerable cost saving in certain US markets. In addition, system innovation by means of improved engineering may also produce cost savings of upwards of 20%, according to experts.[34] New engineering knowledge and technologies offer the opportunity to transform the way water systems are constructed and managed.

The focus of information technology deployment has shifted from the central treatment plant and supply to include real-time optimization of the whole system. New models embed data and process it throughout the entire water value chain to balance all inputs, outputs and stakeholders' water use actions. The long-term result is envisioned to include a dynamic and holistic data-driven picture that supports improved asset allocation and decision-making. Such capabilities are expected to help save energy, improve dynamic charging ability, monitor water quality, extend infrastructure longevity and reduce capital expenditure by managing peak demand.[35]

This holistic approach is also reflected in growing recognition of the need for cross-agency collaboration and the active involvement of all stakeholders in joint management processes.[36] Businesses and municipalities are putting in place procedures and resources to enable ongoing "bottom-up" dialogue with local stakeholders to ensure that sustainability needs receive appropriate locale-tailored solutions. Concurrently, government "top-down" involvement is evolving, with the aim of understanding better the cost of different alternatives, facilitating the creation of broader and more simplified water markets, enabling local financing options and developing more accommodating regulation. As awareness and discussion of the potential for systemic management grows, so does the realization that much work remains to be done.[37]

Change in the sector is currently driven by necessity. The need for governments and corporations to implement revamped quantitative management practices paired with enabling technologies in water-stressed areas is acute. It is creating a new willingness to explore innovative opportunities with industrial stakeholders leading the way.

5 Conclusions

Given the crucial nature of water sustainability, it is imperative to invest in water infrastructure, innovative technologies and new approaches. In the US, water experts have been pointing to necessary changes for decades, but progress has been limited. Given the fragmentation and risk-aversion among utilities, institutions and policy-makers, it is evident that many in the industry are well aware of the challenges and the fact that market development, institutional changes and regulatory reforms have been slow to happen. Whatever change has occurred has been driven mostly by fiscal stress, operational necessity and technological advancement in other markets.

Today, water scarcity, crumbling infrastructure and climate change are providing additional impetus for change. In markets where these factors have pushed water sustainability initiatives high up the state or regional agenda, substantial water and financial savings have been realized when institutions and businesses have undertaken more collaborative and transparent approaches to water resource management.

To achieve a similar transformation in the US, one that yields economic benefits and ensures water availability, we must build wide support for what is a politically and economically charged endeavor. Mobilizing stakeholders to support new investment and structural reforms will require more forceful communication of the challenges, action plan and anticipated results.

Fact-based leadership can help bridge differences and bring stakeholders together to support market reforms. We need more quantitative transparency regarding water scarcity, allocation and true costs to overcome the inertia regarding the need to innovate water systems across the US.

Better quantitative management will enable benchmark comparison among utilities and stimulate innovation by introducing higher-quality standards, all of which are prerequisites to fundamental change. Anticipated budget allocations, capital-raising needs and financial innovation all highlight the necessity for economic modeling, risk reporting and water accounting.

The US water sector is on the verge of transformation. Water management spurred by scarcity in the US is likely to produce new financing and business models, technological innovation and greater engagement of the public in proactively handling the world's most precious resource.

Action agenda

The following action agenda outlines key initiatives that EY believes should be undertaken to begin addressing the US water challenge. While focused on the US, many of these recommendations are applicable in other markets. Our objective in presenting these recommendations is to contribute both ideas and a sense of urgency to the mounting dialogue on this issue among water stakeholders across the nation.

1. Develop the data and transparency practices needed to establish consistent, comprehensive pricing models that reflect the true economic value of water, inclusive of sustainability and social values, in order to attract investment and promote a better balance of interests among users.

2. Improve quantitative management by establishing common terminology, standards and comparable metrics for water disclosure and footprinting. Develop a current national picture of water sources and monitor trends and usage to provide a common language for accountability and transparency of water resources among utilities, municipalities, corporations and regulators. Moreover, as the water sector moves toward technology-enabled systems management, consistent quantitative approaches will be required to parse increasing amounts of sophisticated data.

3. Consider the opportunity to bring new capital, dynamism and efficiencies to the water sector through private equity-driven consolidation. Privatization is not a panacea, but careful deal structuring and supervision mechanisms can safeguard the public interest while realizing the benefits of consolidation.

4. Spur the development of public-private and public-public partnerships to help close the water funding gap by bringing globally established best practices to the US market. These include establishing governmental PPP agencies, developing standardized contracts and policies, upgrading permitting processes to foster more expedient decision-making and adopting incentives and metrics to align public and private interests. Related measures will also boost the prospects for water reuse, desalination and non-revenue water projects.

5. Strengthen the water innovation ecosystem by establishing industry frameworks for assessing and adopting new technologies. This would involve creating utility consortia to incubate, validate and promote new technologies and would reduce the need for emerging companies to undergo multiple field trials and encourage large utilities to set R&D budgets. In the same way that staged clinical trials in the biotech industry allow investors, acquirers and end users to understand risk in that industry, a transparent, generally accepted framework for water technology assessment could help speed innovation adoption in the water sector.

6. Open up conservative utility bidding procedures and update building codes to allow for procurement of efficient cutting-edge equipment and technologies.

7. Encourage innovation and competition in serving water systems by providing incentives for consultant rotation, independent advice and transparent bidding processes. This would challenge conservative procurement and engineering habits stemming from decades-old entrenched relationships.

8. Expand the decoupling of regulated utility revenues from water consumption to enable investments in conservation and efficiency, especially in water-stressed regions. While California's four-year experience in water utility decoupling has not been perfect, it has nonetheless been considered a success and thus can provide a case study for other regions. However, decoupling can only occur in a progressive regulatory environment and will likely require a state and federal regulatory push.

9. Consider more closely long-term capital expenditure needs and water source availability, as well as the traditional financial indicators, in the formulation of water utility bond ratings. Only then will a full picture of risk be established. Such an approach to credit ratings could help promote better financial planning among utilities, including addressing the funding gap and managing infrastructure rehabilitation more effectively.

10. Convene the various institutions with oversight on water to set a coherent national water agenda, one that includes efficiency goals, upon which updated regulations and implementation mechanisms would be based. As part of the new water efficiency measures in a national water agenda, it would be advisable to go beyond utility cost recovery and to reward efficiency by permitting water utilities to keep part of the cost savings they can generate.

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From start-ups to large corporations to national governments, organizations worldwide are embracing cleantech as an engine of growth, efficiency, sustainability and competitive advantage. As cleantech enables the transformation of a variety of industries, old and new, to be part of a more resource-efficient and low-carbon economy, we see innovation in technology, business models, financing mechanisms, cross-industry partnerships and corporate adoption.

EY's Global Cleantech Center offers you a worldwide team of professionals in assurance, tax, transaction and advisory services who understand the business dynamics of cleantech and are committed to helping you realize the potential and address the challenges of the many opportunities arising in this space. Cleantech touches almost every sector — the Center's broad network stands ready to provide you with the insights you need, whatever your business. It's how EY makes a difference.

EY and the water sector

The water sector is increasingly at the center of many industrial, geopolitical and social agendas. Water is a fundamental requirement for human life, but quality and security of supply is also fundamental to economic activity, including power generation, mining and many industrial and consumer goods sectors.

The water sector must respond to the supply/demand imbalance created through the combined effects of demographic and climate change, both through regulatory reform to better protect water resources and encourage demand management, and through infrastructure investment to secure drinking water supply, improve wastewater treatment and enhance civil infrastructure resilience arising from changing rainfall patterns.

At the same time, the water/energy nexus demands improved carbon efficiency throughout the water supply chain itself and improved water efficiency within power generation.

EY is well positioned to advise governments and power and utilities clients on their water and wastewater activities, due to the breadth of our global water network, our experience within the water and wastewater sectors across the value chain, and the close integration of the team within EY with related industry sectors.

Our deep water industry insights and relationships across the water value chain allow us to advise innovative water technology companies and their investors on global growth challenges, from capital raising to strategic transactions, partnerships, financial reporting and tax structuring.

EY's water capabilities

We offer a comprehensive range of services to players throughout the value chain of the global water sector:

- Advise governments and utilities on policy and strategic issues related to the water industry, including market structuring, economic regulation and tariff setting
- Advise on everything from supply chain management to operational performance improvements and efficiencies, drawing on our strong credentials in risk and business advisory services related to the water industry
- Provide financial, commercial and tax due diligence to some of the largest water transactions in the market
- Advise on the development, procurement and financing of complex water infrastructure projects through design/build/finance/operate, build/operate/transfer and public-private partnership structures
- Advise on secondary market/infrastructure M&A transactions in the sector
- Serve as the audit and tax advisor to leading water technology innovators in all the major water hubs around world
- Provide lead advisory/M&A advice to water cleantech companies and venture capitalists in the water supply chain
- Advise cleantech water companies on IPO and M&A readiness, partnerships and alliances, global expansion and other growth challenges
- Assist venture and corporate investors in understanding the water innovation landscape.
- Provide audit services to water utility companies across Europe, Asia and the US

Contacts

Global

Gil Forer
Global Cleantech Leader
+1 212 773 0335
gil.forer@ey.com

Christine Staub
Global Water Network Leader
+33 1 46 93 78 84
christine.staub@fr.ey.com

Americas

Americas/US

Jay Spencer
Cleantech
+1 617 585 1882
jay.spencer@ey.com

Canada

Cynthia Orr
Cleantech
+1 604 643 5430
cynthia.l.orr@ca.ey.com

South America/Brazil

Daniel Maranhão
Cleantech
+55 11 3054 0000
daniel.maranhao@br.ey.com

United States

James C. Kaufman
Water Network
+1 215 448 5100
james.kaufman@ey.com

EMEIA (Europe, Middle East, India and Africa)

EMEIA/Germany

Robert Seiter
Cleantech
+49 30 25471 21415
robert.seiter@de.ey.com

Central/Southern Europe

Piotr Piela
Water Network
+48 22 557 7580
piotr.piela@pl.ey.com

Josef Pivonka
Water Network
+420 225 335 603
josef.pivonka@cz.ey.com

Finland

Mikko Rytilahti
Cleantech
+358 207 280 190
mikko.rytilahti@fi.ey.com

France

Alexis Gazzo
Cleantech
+33 1 4693 6398
alexis.gazzo@fr.ey.com

Christine Staub
Water Network
+33 1 46 93 78 84
christine.staub@fr.ey.com

India

Sanjay Chakrabarti
Cleantech
+91 22 4035 6650
sanjay.chakrabarti@in.ey.com

Nutan Zarapkar
Water Network
+91 22 6192 1316
nutan.zarapkar@in.ey.com

Israel

Itay Zetelny
Cleantech/Water
+972 627 6176
itay.zetelny@il.ey.com

Italy

Andrea Paliani
Cleantech
+39 02 8066 9761
andrea.paliani@it.ey.com

Middle East/North Africa

Michael Hasbani
Cleantech
+971 4 312 9141
michael.hasbani@ae.ey.com

Nimer AbuAli
Cleantech
+971 2 417 4566
nimer.abuali@ae.ey.com

Ahmad Ahmad
Water Network
+966 1 215 9898
ahmad.ahmad@sa.ey.com

Netherlands

Wolfgang Paardekooper
Cleantech
+31 10 406 8159
wolfgang.paardekooper@nl.ey.com

Nordics/Denmark

Karsten Bøgel
Cleantech
+45 35 87 29 44
karsten.boegel@dk.ey.com

Russia

Alexander Yerofeyev
Water Network
+7 495 755 9710
alexander.yerofeyev@ru.ey.com

South Africa

Norman Ndaba
Cleantech
+27 11 772 3294
norman.ndaba@za.ey.com

Switzerland

Rico Fehr
Cleantech
+41 58 286 4065
rico.fehr@ch.ey.com

United Kingdom

Mark Turner
Water Network
+44 20 7951 1622
mturner@uk.ey.com

Stephen Smith
Cleantech/Water
+44 117 981 2254
ssmith2@uk.ey.com

Asia-Pacific

Asia-Pacific/Greater China

Paul Go
Cleantech
+86 10 5815 3688
paul.go@cn.ey.com

Australia

Mathew Nelson
Cleantech
+61 3 9288 8121
mathew.nelson@au.ey.com

Bill Banks
Water Network
+61 2 9248 4522
bill.banks@au.ey.com

David Cochrane
Water Network
+61 3 9655 2551
david.cochrane@au.ey.com

China

Camille de Guillebon
Water Network
+86 21 2228 2293
camille.de-guillebon@cn.ey.com

Japan

Pierre-Yves Caer
Water Network
+81 3 3503 1499 1280
caer-prryvs@shinnihon.or.jp

Malaysia

Adam Zechariah
Water Network
+60 3 7495 8850
adam.zechariah@my.ey.com

Singapore

Krishna Sadashiv
Cleantech
+65 6309 8813
k.sadashiv@sg.ey.com

Harsha Basnayake
Water Network
Singapore
+65 6309 6741
harsha.basnayake@sg.ey.com

South Korea

Moon-ho Choi
Cleantech
+82 2 3787 6703
moon-ho.choi@kr.ey.com

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