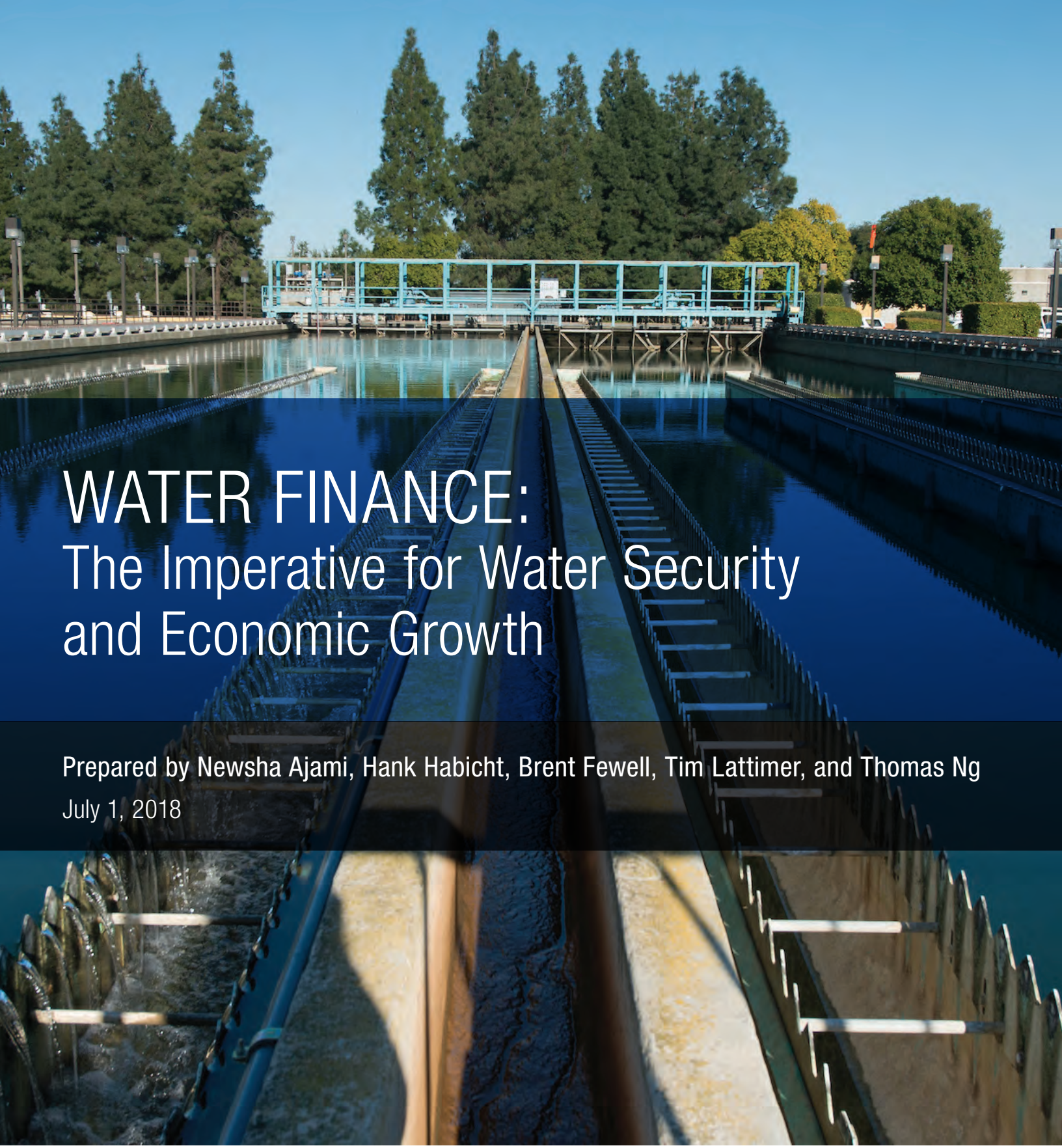

WATER FINANCE:
The Imperative for Water Security and Economic Growth

Prepared by Newsha Ajami, Hank Habicht, Brent Fewell, Tim Lattimer, and Thomas Ng

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Water in the West

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ReNUWIt
Re-inventing the Nation's
URBAN WATER
INFRASTRUCTURE

U.S. WATER
PARTNERSHIP
for a water secure world

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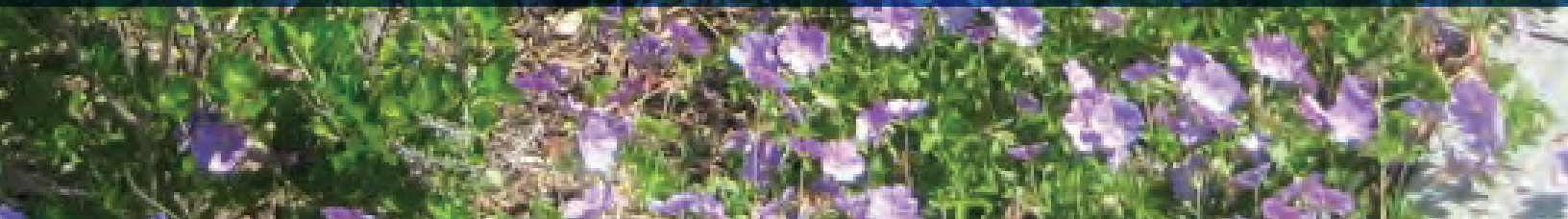

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Acknowledgements

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Findings, interpretations, and conclusions included in this report are those of the authors and do not necessarily reflect the views of each individual organization or those who provided review.

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About Water in the West

Water in the West is a partnership of the faculty, staff and students of the Stanford Woods Institute for the Environment and the Bill Lane Center for the American West. The mission of Water in the West is to design, articulate, and advance sustainable water management for the people and environment of the American West. Linking ideas to action, we accomplish our mission by engaging in cutting-edge research, creative problem solving, active collaboration with decision-makers and opinion leaders, effective public communications and hands-on education of students. To learn more visit: **waterinthewest.stanford.edu**.

EXECUTIVE SUMMARY

Water is the essential and irreplaceable element for life and livelihoods throughout the globe. Yet, unsafe water and poor sanitation together are the single largest cause of illness worldwide, as nearly two million children die each year from preventable diarrheal diseases. Droughts and floods affect more people than all other natural disasters combined. Nearly two-thirds of the world's people are expected to live under water-stressed conditions by 2025, impacting levels of disease, food production, and other basic quality of life measures. Experts in and out of government confirm that safe water infrastructure is a fundamental component of economic health. In the United States alone, the American Society of Civil Engineers has estimated that failure to close the gap in investments required for water and sanitation, "would cause the United States to lose nearly 500,000 jobs by 2025. Unless the infrastructure deficit is addressed by 2040, 956,000 jobs will be at risk relative to what is otherwise anticipated for that year. By 2025, the nation will have lost over $508 billion in GDP, while the cumulative impact through 2040 is expected to be $3.2 trillion of GDP" (ASCE, 2016). It is also increasingly clear from work done by USWP and other experts that the health of water systems and infrastructure are essential to domestic and global security as well. Access to water and sanitation depends upon a reliable water infrastructure system that preserves, treats, and delivers safe drinking water to consumers and a system that collects and treats wastewater adequately. Growing consumer demands, aging infrastructure, and a changing climate aggravate water scarcity and portend increased tensions within and between countries in many parts of the world.

Water security challenges do not only exist outside U.S. borders. There are sometimes different financing priorities domestically and globally, but the challenges are similar. We require a strategy that makes water infrastructure a higher priority for both domestic and international investment, and in a system where lessons learned can be effectively shared across borders. There is an imperative both domestically and globally for public and non-public sources of capital to be as coordinated as possible.

Our research and discussions through our network identifies a number of common themes. The most prominent of these is that the massive need for infrastructure investment is spread across a large number of small to medium size systems. The opportunity to combine and blend financing around groups of facilities is substantial, as is the need to be sure that new distributed technologies and approaches are made available to resource-constrained operators in these smaller systems.

In addition, domestically and internationally, both the risks related to water and the value of water are underappreciated. A key to changing this inertia is a function of improved coordination and communication across sources of funding and key agencies.

The inescapable reality is that meeting all of these challenges requires a rapid tripling of water and wastewater investments beyond existing levels. In the United States, this means ramping up water investments from about $41 billion to $123 billion per year. Globally, this means investing in water and wastewater to the tune of about $6.7 trillion by 2030 and $22.6 trillion by 2050. Despite pressing needs and the availability of vast sums of capital and financial tools from a plethora of domestic and international sources, both public and private, we will not be able to attain such increases in investment without overcoming long-standing obstacles, most of which are related to governance and institutional arrangements.

These obstacles include:

United States	International
• **Limited federal funding for water and wastewater infrastructure,** as the percentage of federal infrastructure spending that goes to the water sector has fallen from 63% to only 9%.	• **Uncertainty about the sustainability and availability of future funding,** owing to serious fluctuations in the year-to-year amounts of aid provided by both large and small institutions and a lack of long-term sustained sources of funding for large projects.
• **Structural obstacles to investment,** such as the water sector's need for high up-front capital investments combined with long-term payback periods. • **Cultural obstacles to investment,** which arise from divergent views on the role of private water companies.	• **Shortage of financial and/or human resources,** owing to weak cost recovery, the myriad other barriers to domestic and foreign investment, and unpredictable flows of foreign assistance.
• **Weak managerial and/or financial capacity among water and wastewater operators,** as nearly half of the nation's 53,000 water systems are very small (serving less than 500 people of less), which suggests a need for consolidation and networking among smaller systems. • **Poor local governance,** owing to the political sensitivities around water pricing that prompt many state and local governments, in statute or as a matter of policy, to forbid service providers from charging customers differently based on their ability to pay.	• **Lack of creditworthy or reliable service providers,** as many water service providers or projects are unable to use funding effectively, resulting in water finance absorption rates of 54-60% and 38-48% for domestic and foreign aid funds, respectively.
• **Lack of data and information,** as project developers and prospective financiers often lack sufficient information, thus leading to mismatches or missed opportunities for water investments. • **Affordability,** as many utilities struggle to fully recover costs without adversely affecting low-income communities.	• **Lack of data for informed decision-making,** owing to inadequate collection, management, and/or use of financial data by water and wastewater service providers (i.e., data on billing, collections, service provision, and budget performance).
• **Lack of full cost recovery in pricing water tariffs,** as only one third of U.S. water utilities have rate structures that provide adequate revenue to fully cover their costs.	

Recommendations

For the United States

1. Establish a comprehensive, integrated, and strategic approach grounded in robust, bottom-up collaboration.
2. Refocus and integrate the priorities and authority of U.S. government agencies related to water.
3. Encourage formation of, and participate actively in, a U.S. water finance exchange or "hub" which focuses on catalyzing actual projects.
4. Identify "transformative" policy ideas to change decision-making at local level, including consolidation and partnerships (public-public and public-private)
5. Increase public outlays in water and wastewater infrastructure.
6. Incentivize greater private participation in infrastructure service delivery, including investment, by reducing risks and linking various risk portfolios and products, as appropriate, to federal and private financiers.
7. Develop a unified water data and information network.
8. Accelerate the innovation and adoption of new technologies.

For International Finance Institutions and Other Donors

1. Continue to elevate water as a priority.
2. Continue to boost stronger coordination of policymaking among water and finance authorities.
3. Focus on catalyzing and evaluating projects which employ innovative approaches and technologies.
4. Look beyond traditional "hardware" (i.e., grey infrastructure) solutions and boost emphasis on "green" infrastructure and "software" solutions that strengthen fundamental governance capacities.
5. Where appropriate, take a stronger role in leading in-country donor coordination.

For Developing Countries

1. Create and maintain stable and predictable policy frameworks as part of a broader commitment to the rule of law.
2. Signal government commitment and a "whole of government" approach to water and wastewater infrastructure development.
3. Maintain a level and competitive playing field.
4. Undertake transparent and robust stakeholder engagement to balance affordability and cost-recovery in setting water tariffs. If tariffs are below service costs, and subsidies are needed, governments, not utilities, should bear these costs.
5. Better targeting of subsidies to the poorest/most vulnerable is crucial. Currently wealthier consumers are benefitting from most of the subsidies.
6. Invest in data collection and management, and information sharing.
7. Develop and publish long-term investment plans to promote greater financing from institutional investors.

For Private Investors

1. Share information to make transparency a two-way “street” with public investors and utility managers.
2. Implement projects. Work together with key public institutions to generate and evaluate projects.
3. Support the use of innovative technology.
4. Collaborate with each other and with likeminded public officials to advance institutional reforms.
5. Demonstrate genuine good corporate citizenship.

WATER FINANCE – A CRITICAL LINCHPIN FOR DEVELOPMENT

"Thousands have lived without love, not one without water." W. H. Auden

Water is essential to all of life on Earth. Like the air we breathe, water is a crucial for human health and well-being. It is a vital element for which there are no alternatives. Globally, between 1990 and 2015, some 2.6 billion people gained access to improved water sources while about 2.1 billion obtained access to improved sanitation facilities. However, the distribution of these gains was uneven as, for example, improved sanitation coverage in Sub-Saharan Africa grew by only 6%, compared to a 29% increase in East Asia (UNICEF and World Bank, 2017). Moreover, despite the gains of the past two decades, an estimated 663 million people still do not have ready access to clean water and about 1 in 3 people – some 2.4 billion – do not use improved sanitation facilities. At least 1.8 billion people use water sources that are fecally contaminated, while nearly 1,000 children die each day due to preventable water and sanitation related diarrheal diseases (UN Water). More than half of the hospital beds around the world are occupied with patients who suffer from illnesses related to contaminated water.

Water is also essential for livelihoods. Nearly 80 percent of the jobs constituting the global workforce are water-dependent. The nearly 1 billion people who work in the world's farming, forestry, and fisheries sectors are heavily dependent on water. Agriculture accounts for about 70% of total freshwater withdrawals in the world and more than 90% in most least developed countries. Rising food demand, together with the impacts of climate change, will put added stress on increasingly scarce water resources.

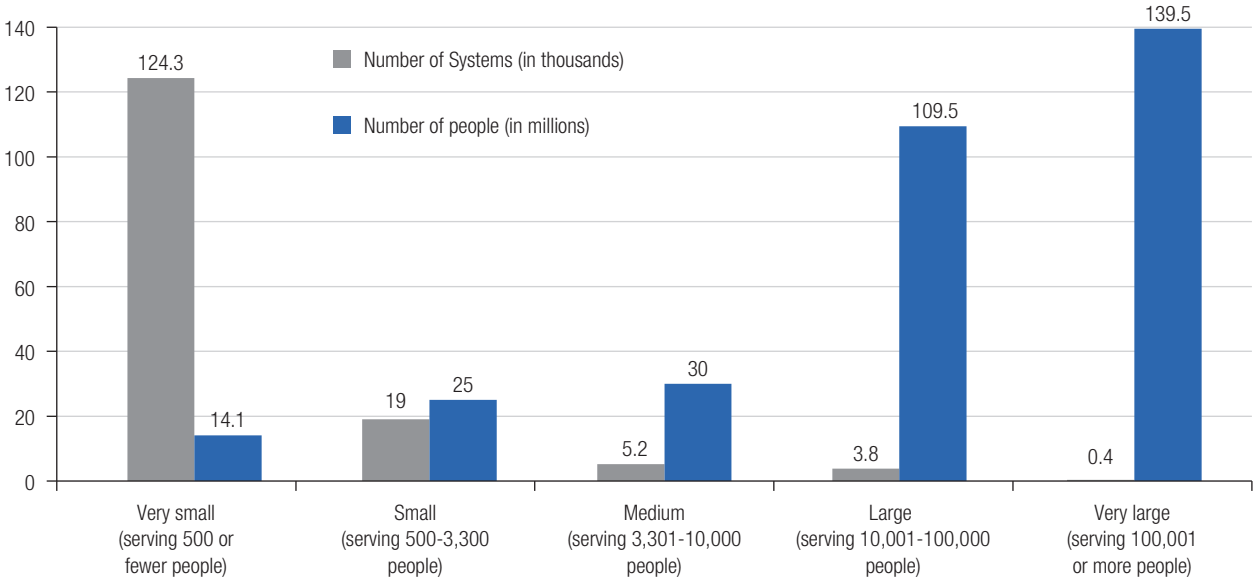
Most of the world's electricity production depends on water for cooling or for hydroelectric generation. As a result, energy production uses about 15% of the world's water. Global energy demand is projected to increase by 30% by 2040. Electricity will take an increasingly larger share of final energy consumption, from about one-quarter of energy consumption today to nearly 40% in 2040, which means the energy sector's water demands will add further stress on water resources (International Energy Agency, "World Energy Outlook 2016").

Investment Requirements

Infrastructure: Access to water depends upon a reliable water infrastructure system that preserves, treats, and delivers safe drinking water to consumers. Globally, simply meeting the UN's Sustainable Development Goals (SDGs) for water would require the investment of an estimated $1.7 trillion by 2030, which is three times current investment levels. More broadly, global water infrastructure development is estimated to require $6.7 trillion by 2030 and $22.6 trillion by 2050 (OECD).

In the United States, most of the nation's 53,000 federally-regulated community water systems have been in operation for 75 to 100 years or longer, typically using infrastructure that has well exceeded expected lifespans. As shown in Figure 1, small operators represent the vast majority of U.S. water systems. Many communities, particularly those in rural and low-income areas, struggle to maintain and operate existing water treatment systems. Much of the country's water infrastructure, including the more than one million miles of pipes, is nearing the end of, or has exceeded, its useful life and must be replaced.

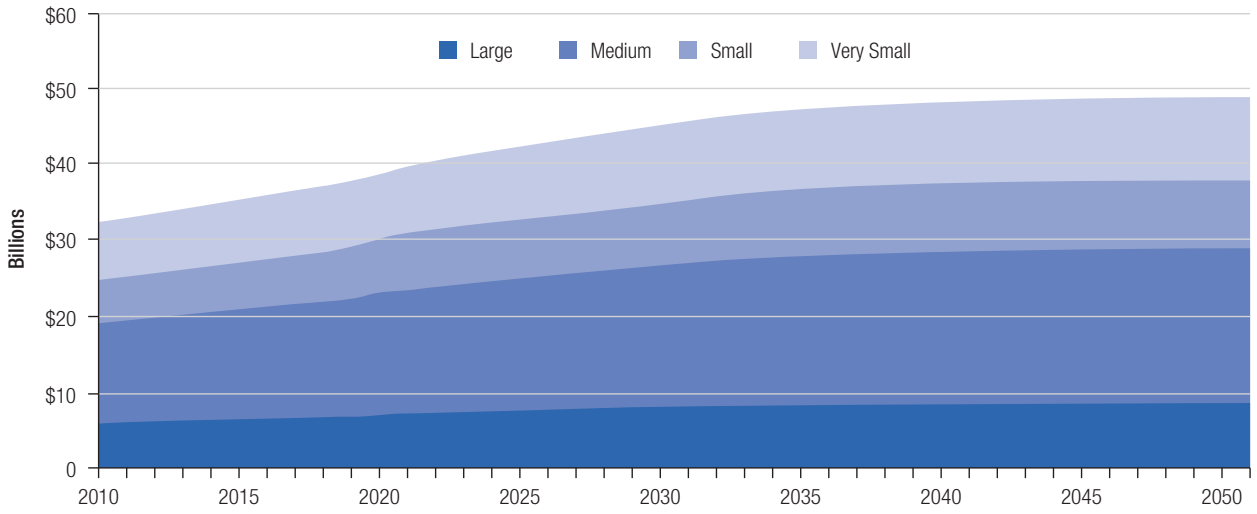
Figure 1: Number of water systems by their size and the population they served in 2011.



Source: Environmental Protection Agency 2013. Note: "Water systems" refers to active public drinking water systems regularly supplying drinking water to at least twenty-five people or having fifteen service connections for sixty or more days of the year.

The American Society of Civil Engineers (ASCE) estimates that the United States must invest at least $123 billion per year in water infrastructure over the next ten years to achieve a "good state of repair." Yet we currently invest only about $41 billion, i.e., funding only about one-third of our water infrastructure needs, leaving a gap of about $82 billion per year. The U.S. Environmental Protection Agency (EPA) estimates that the country will need a $660 billion investment for water and wastewater systems over the next 20 years. The American Water Works Association has estimated that restoring and expanding water and wastewater infrastructure in the United States will cost more than $1 trillion over the next 25 years. Figure 2 shows AWWA's estimate solely for water mains in the United States.

Figure 2: Total Water Main Replacement and Growth Needs by System Size



Source: American Water Works Association, "Buried No Longer: Confronting America's Water Infrastructure Challenge," 2016.

The water infrastructure crisis also represents a tremendous opportunity as water infrastructure development means more jobs. In the United States, every $1 billion invested in infrastructure creates or supports 28,500 jobs, and every dollar invested in water and wastewater infrastructure adds $6.35 to the national economy. With the increase in GDP, every dollar of water infrastructure investment generates $1.35 in tax revenue to the federal government and $.68 to state and local governments, representing tax revenues to help pay for infrastructure investment.

Institutions: Many water operators around the world face systemic challenges associated with the technical and managerial capacity of their personnel, aging workforces, staff attrition and the associated loss of experience, and weak interest from new graduates to join the water industry (OECD, 2017). This is a particular challenge for water operators in rural and low-income communities. As a result, water and finance industry experts increasingly recognize that institutional shortcomings (i.e., governance) represent the main obstacles to greater investment in water and wastewater infrastructure. This points to a need for significant investment in human resources (including technical capacity building), technology, and data and information tools.

DOMESTIC WATER FINANCE CHALLENGES, SOLUTIONS, AND TOOLS

Water Finance Sources in the United States

Public Agencies

Traditional financing for water system improvements and maintenance is currently predominantly handled by utilities in one of two ways, through: (1) **cash financing:** which draws from current revenue at hand for utilities gathered from water rates, service fees, connection fees from new accounts, or taxes; or (2) **debt financing:** which raises upfront capital through the issuance of municipal bonds (The Johnson Foundation, 2012; Ajami & Christian-Smith, 2013). Due to the often large-scale, capital-intensive nature of constructing new water projects, debt financing is usually the preferred method for utilities who are often already too cash-strapped from just handling day-to-day operations (The Johnson Foundation, 2012).

Local governments can use one or several of the following three financing instruments to acquire capital:

Bonds: One of the primary tools of debt financing used by local governments to acquire capital, bonds enable utilities to generate funds by selling bonds to investors with the promise to repay them the initial principal plus a specified rate of interest calculated over the life of the bond (U.S. Securities and Exchange Commission, 2017). Specifically, **municipal bonds**, which are debt securities issued by local governments, have been the most popular (Epstein, 2016; Ajami & Christian-Smith, 2013). Three common types of municipal bonds include: (1) **general obligation bonds**, which are issued by states, cities, or counties to the public and are backed simply by the taxing power that they have on taxpayers to repay their investors; (2) **revenue bonds**, which are similarly issued by government authorities to the public, but are backed by revenues generated from the operation of the project being financed (USEPA, 2008); and lastly, (3) private activity bonds, which are issued by a or on behalf of government project sponsor authorities, or on their behalf by a conduit municipal entity, for the purpose of funding a project being developed by one or several private partners, such as in a PPP (Internal Revenue Service, 2016).

Loans and Grants: Other methods of financing available to utilities to generate capital for projects. In the case where utilities' capital needs are too small for the bond market, they must rely on other sources such as loans or grants at the federal, state, or local level to administer their capital improvement programs (The Johnson Foundation, 2012). Loans are sums of money usually provided by governments, at a lower interest rate compared to commercial loans, associated with a specific goal in mind for projects that will have to be repaid after a certain amount of time. Grants on the other hand are sums of money awarded by agencies or organizations with specific goals in mind, similar to loans, that often have more difficult application procedures, deadlines, and mandates than bonds, but do not require a payback at the end of its funding period (USEPA, 2008).

There are several major loans and grants programs available for utilities, but they are typically tied to specific mandates set by the issuing organization and have strict application procedures and deadlines (USEPA, 2008). Examples of several major loans and grants sources at the federal, state, and local level in the U.S. are listed below. Although the major funding sources have been listed here, there are many additional types of bonds, grants, and loans available that can provide both financial and technical resources for local governments.

Table 1. Loans and Grants Financial Assistance Programs in the U.S.

Program	Description
EPA Office of Water – **Clean Water State Revolving Fund (CWSRF)**	Established in 1987 following amendments made to the Clean Water Act (CWA), states, working in partnership with EPA, provide financial assistance, largely in the form of loans to communities of all sizes to construct wastewater infrastructure projects. State CWSRFs have provided more than $111 billion to communities through 2015 (USEPA, 2017b). The CWA allows financial assistance to be made to private sponsors for non-point source projects.
EPA Office of Water – **Drinking Water State Revolving Fund (DWSRF)**	Established in 1996 following amendments made to the Safe Drinking Water Act (SDWA), states working in partnership with EPA, provide financial assistance, largely in the form of loans to communities of all sizes, to construct water infrastructure projects. State DWSRFs have provided over $32.5 billion to water systems through 2016 (USEPA, 2017b). The SDWA allows financial assistance to be made available to public or private project sponsors for all classes of projects.
Water Infrastructure Finance and Innovation Act (WIFIA) Program	Established in 2014, WIFIA is a federal loan/credit program managed by EPA to help communities finance water and wastewater projects, expected to leverage $1.5 billion in federal loans (USEPA, 2017b).
U.S. Department of Agriculture (USDA) – **Rural Development Water and Environment Program (WEP)**	Provides water and wastewater infrastructure financing to communities with populations less than 10,000. USDA has funded over $13.9 billion for 5,825 projects. WEP also provides technical assistance and training to rural communities for their water and wastewater activities (USDA, 2017b).
U.S. Department of Housing and Urban Development (HUD) – **Community Development Block Grants (CDBG)**	Established in 1974, CDBG provides block grant funds to states for distribution to low and moderate-income areas to fund local community development activities. It is estimated that about 10 percent of funding is used for water and wastewater infrastructure projects (Gomez, 2013; HUD, 2017).
Department of Commerce Economic Development Administration (EDA) – **Public Works and Economic Development Program**	Provides grants to small, disadvantaged, and economically-distressed communities to construct public facilities, including drinking water and wastewater facilities, to create jobs and attract private investment (USEPA, 2017b; U.S. EDA, 2017).
Department of Interior (DOI) – Bureau of Reclamation (BOR) – **Title XVI Water Reclamation and Reuse**	Provides funding for the planning, design, and construction of water recycling and reuse projects in partnership with local government entities. Since 1992, Title XVI has used approximately $639 million in federal funds and more than $2.4 billion in non-federal funds to construct projects (U.S. DOI – BOR, 2017).
BOR – **Rural Water Supply Program**	Established following the Rural Water Supply Act of 2006, the Rural Water Supply Program provides financial assistance for individual water supply projects in communities with populations less than 50,000 (U.S. DOI – BOR, 2015).
U.S. Army Corps of Engineers (ACE)	Provides assistance for water supply and wastewater infrastructure projects for locations authorized by Congress (Gomez, 2013).
Indian Health Service	Provides funding for water and wastewater infrastructure projects on tribal lands (Gomez, 2013).

Private Sector

Aside from public financing assistance programs, utilities can also find resources in the private sector. **Public-private partnerships (PPPs)**, or contracts between a private party and a government entity for providing public assets or services, can provide utilities with resources beyond what they currently have at their disposal (Epstein, 2016). The private role in the U.S. water and wastewater provision dates back to the mid-1800s when most water utilities were privately owned and operated. Private sector participation in the United States will range in both respects to the degree and duration of private sector participation from simple consulting contracts to full-fledged investor-owned utilities. Although PPPs have been around ever since the early 1900s, they have been used relatively little in the water sector in the United States, especially when compared to the energy or telecommunications sectors (Engel, Fischer, & Galetovic, 2009); however, given the limited amount of funding options presently available to stressed utilities seeking to restore aging water systems or to construct new water projects, PPPs offer an increasingly attractive financing pathway to secure the necessary resources that would otherwise be tougher to obtain from bonds, loans, or grants (The Johnson Foundation, 2012). A number of existing examples in the United States include private capital funding arrangements which were essential for communities to address financial stresses that were otherwise limiting its funding options and its ability to address system needs (see Bayonne, NJ example on page 13).

Public-private partnerships can come in many different contract types that dictate how much responsibility and risk is borne by the public sector versus private investors (World Bank, 2014). Contracts are described through a combination of project phases or functions that determine the extent of the private party's responsibility in each project (World Bank, 2014). It is important to note that PPPs often come with higher upfront costs. This is largely attributable to the unique advantages that PPPs can offer and is in part the result of alternative procurement arrangements. Such arrangements require a full vetting and allocation between the community (the project sponsor) and service provider of all project delivery and operational risks across the project lifecycle that tend to be overlooked under traditional Design, Bid, Build ("DBB") procurements. Higher upfront costs generally associated with PPPs result from these risk transfers to the service provider that, in DBB procurements, are fully absorbed by the project sponsor and are seldom quantified. Given the many different combinations of functions possible, PPPs offer public utilities the flexibility to seek project delivery, management and financing arrangements however they desire by defining their preferred contractual agreements in the beginning. A few examples of typical functions are listed in Table 2 below:

Table 2. Examples of PPP Contract Function Types

Functions	Description
Design	Developing construction-ready design specifications using the project's initial concept and output requirements.
Build	Constructing the designed specifications and installing equipment.
Finance	Funding all or part of the project's capital expenditures.
Maintain	Maintaining the infrastructure asset up to a certain standard over the life of a contract.
Operate	Operating the asset to continue providing services to either a government off-taker, direct users, or simply by providing technical support.
Transfer	Transferal of asset ownership from the private entity to the public agency after completion.

Source: World Bank, 2014

If structured appropriately, PPPs can potentially generate value for money by delivering projects more cheaply, faster, and with higher quality compared to public sector delivery, assuming fiscal risks are properly managed. PPPs can also provide numerous benefits throughout the entire procurement process of water projects (Boyer, Cooper, & Kavinoky, 2012). They can allow communities to gain access to alternative financial and technical resources, allow for greater scrutiny and quality of work conducted, share project risks, and provide opportunities for private partners as they seek to fulfill project outcomes in innovative ways (Boyer, Cooper, & Kavinoky, 2012).

Recently, a new PPP model known as Community-Based Public-Private Partnerships (CBP3) has started emerging in the water sector. It includes many features of a traditional PPP but also seeks to establish a "relational" contract based on long-term trust and confidence between partners, as opposed to a "transactional" contract based on static metrics for reimbursement that are less complex and flexible (USEPA Region 3 Water Protection Division, 2015). CBP3s focus on benefiting not only water providers and their private partners, but also the local community in which the project is being constructed. CBP3s strive to create local jobs, provide opportunities for community outreach and educational advancement, and improve the lives of those living in urban and underserved communities.

Concessionaire models have also gained increasing popularity in the U.S., where the community retains ownership of the assets, but a private entity steps into the shoes of the public entity, assuming operational control as well as responsibility for capital investment. For example, in 2012 the City of Bayonne, New Jersey, entered into a 40-year contract with Suez/United Water and Kohlberg Kravitz & Roberts, with an upfront concession fee of $150 million with annual expenditures up to $500,000 for operations (OPEX) and $2.5 million in capital (CAPEX).

By working with private entities interested in long-term investments, as opposed to those interested in quick, short-term returns, municipalities can take advantage of the benefits of a traditional PPP and in addition help to stimulate local economic growth, preserve the environment, and improve the quality of life for urban and impoverished neighborhoods (USEPA Region 3 Water Protection Division, 2015). Promising community- and sustainability-oriented PPPs are starting to gain traction as private interests align with public agencies' goals, long-term trust and confidence between stakeholders is established, and regulatory performance targets are affordably, efficiently, and promptly met.

Key Obstacles to Meeting the U.S. Water Finance Gap

The financial landscape is laden with challenges that prevent utilities and municipalities from securing the funds needed to finance new projects (Hanak, et al., 2014), thus hampering the country's ability to close the aforementioned annual investment gap of $82 billion. As a result, despite the broad range of different sources of funding available to water service providers, several key obstacles continue to prevent the United States from closing the water/wastewater infrastructure finance gap. These obstacles are summarized below.

1. **Lack of full cost recovery in pricing water tariffs.** Approximately 98% of water projects are financed by local water utilities through their rate structures. However, there exists a disparity between the needs of water utilities and their ability to generate funds at the local level due to inefficient water pricing models that provide variable revenue streams while paying fixed expenses (Bartlett, Cisneros, Heartwell, McAndrew, & Warnock, 2017). Thus, many utilities face a conundrum when revenue streams are insufficient to cover the costs of operational and maintenance costs. A recent survey found that only one-third of water utilities are operating under rate structures that provide adequate revenue to fully cover their costs. This undervaluation of water as a commodity creates severe constraints on the ability of utilities to finance the investment required as their infrastructure continues to age. Further, owing to the political sensitivities around water pricing, many state and local governments don't allow service providers to charge customers differently based on their ability to pay. As a result, many utilities may struggle to find a way to recover costs without adversely affecting low-income communities (Bartlett, Cisneros, Heartwell, McAndrew, & Warnock, 2017). When customers conserve water during times of drought or economic hardship, revenue for utilities will also drop, creating a problem as their debt payments for fixed capital costs as well as other fixed cost related to operational and maintenance of the system remains unchanged (Bartlett, Cisneros, Heartwell, McAndrew, & Warnock, 2017).

2. **Significant declines in federal funding for water and wastewater infrastructure.** Although federal funding first enabled the construction of much of the water and wastewater infrastructure we see today, current levels of federal funding for infrastructure projects are insufficient to maintain and upgrade existing systems (Table Rock Capital, 2014). Today, the United States has a $60 billion backlog in congressionally authorized but unfunded water and wastewater projects. Since 1977, the percentage of federal infrastructure spending that goes to the water sector has fallen from 63% to only 9%. For example, the Clean Water State Revolving Fund (CWSRF)—one of the primary sources of water and wastewater infrastructure funding in the nation—appropriated a total of $2.5 billion in 2012 (Table Rock Capital, 2014), representing only about 2% of the ASCE's estimated annual need of $123 billion in water and wastewater infrastructure spending. Cuts in federal and state assistance in recent years have also exacerbated the situation; between the years 2008 and 2012, 32 states cut aid to municipalities (Table Rock Capital, 2014). With limited public funding, local utilities and municipalities have also started to consider private sector partnerships for a much-needed boost in capital (The Johnson Foundation, 2012); however, private investors are hesitant to invest due to potentially high risks, lack of experience, slow rates of return, long pay-back periods, and small earnings (Musick & Petz, 2015; Leonard, 2015).

3. **Lack of policy coherence.** Water policy and regulation in United States is highly fragmented. More than forty congressional committees and sub-committees oversee various aspects of water policy, while as many as thirty federal agencies, commissions, and other organizations administer dozens of overlapping and often conflicting agendas, priorities, and programs. Each state administers its funding allocations from the EPA's Clean Water State Revolving Fund (CWSRF) and the Drinking Water State Revolving Fund (DWSRF). These silos of competing and conflicting regulatory and statutory regimes create significant inefficiencies and waste scarce resources, while hamstringing the effective management of water and wastewater infrastructure.

4. **Structural and cultural obstacles to investment.** Even though an estimated $100 billion in private capital is available to invest in the U.S. water and wastewater market, the sector's infrastructure typically requires high levels of initial investments and long payback periods, thus limiting prospects for private investment. Only about 12% of water and wastewater finance comes from the private sector, all of which is limited to state and local projects. Moreover, current regulations discourage many municipalities from entering into cost-saving and efficiency-driven partnerships with private water companies for the operation of municipal water supply and treatment facilities. There are also cultural obstacles to greater private sector participation based on divergent views involving the role of for-profit water companies. For example, advocacy groups such as Food & Water Watch work with certain environmental activists and labor groups to oppose any level of private sector participation.

5. **Lack of data and information.** Project developers and prospective financiers alike often lack sufficient data and information, which can lead to mismatches or missed opportunities for greater investment flows into the water and wastewater sector.

6. **Weak managerial and/or financial capacity of water/wastewater operators.** Nearly half of the nation's 53,000 water systems are very small, i.e., serving fewer than 500 people. These utilities undertake the complex challenge of consistently delivering safe drinking water with a small and under-resourced staff with limited technical skills and training. Not surprisingly, the EPA reported in 2011 that very small system operators have the highest percentage of health-based violations of all system sizes (74 %), putting at risk the health of customers served by those systems.

Solutions & Tools to Close the U.S. Water Finance Gap

Key success factors for water investment, or any infrastructure investment, can be summarized into four broad areas:

- **Finance** – Structure sector-appropriate finance, including a blend of public and private finance, to finance long-term investment programs. A key requirement is the ability to define and estimate long-term investment programs.

- **Infrastructure** – Design sustainable and resilient infrastructure to ensure long-term water security, including integrated infrastructure combining the water source, water treatment, wastewater treatment and recharging/regeneration of water sources as well as cross-sector integration such as water and transportation.
- **Innovation** – Include both technology and business model innovation in order to "leap frog" water system development.
- **Governance** – Put in place regulatory and legal frameworks to facilitate greater investment, and strengthen public institutions with know-how and expertise to engage with finance, technology and infrastructure providers.

Faced with many issues that still plague the financial landscape for the water sector in the U.S., new solutions to water management are needed. Large-scale, centralized water infrastructure has been the traditional model for many water treatment, supply, and distribution networks in the U.S. Yet, these centralized systems can have high operational and maintenance costs, inflexibility, vulnerability to disruption of the natural hydrologic cycle and natural disasters, and exposure to physical security risks. This makes **distributed systems** an attractive alternative (Quesnel, Ajami, & Wyss, 2016; The Johnson Foundation, 2014). As the water sector is transitioning into a more hybrid model encompassing both centralized and decentralized infrastructure, it is important to develop innovative financing mechanisms and governance structures that allow the sector to access resources beyond traditional mechanisms. Table 3 below lists a few examples:

Table 3. Examples of Innovative Financing Mechanisms and Governance Structures

Financing Mechanisms & Governance Structures	Description
Project Aggregation	Grouping of many projects or financial resources to make one larger consortium. In doing so, the implementer and funding source can often be directly connected to facilitate transactions and overcome risk.
Credit Trading	Credit trading facilitates the buying and selling of credits by property owners in an open market. Credits can be associated with conservation, stormwater retention or alternative water generation and are generated based on going beyond a target set for every household or community to meet within a specific timeframe.
Reverse Auction	A type of auction where sellers compete with one another to provide a service or good to the buyer. Given competition between many sellers, the reverse auction serves as a cost-effective tool to identify and secure bids that provide the highest environmental benefit at the lowest available cost to the buyer.
On-Bill Financing	Also known as utility-enabled financing and repayment, helps residents or businesses overcome the financial barriers by installing customer-level distributed projects at no upfront cost, but then recoups their investment by assessing customers with a fee on their water or property bills.
Impact Bonds	Environmental or social impact bonds are pay-for-success contracts, whereby the utility will either pay or be paid an outcome amount from its investors depending on the success of a project. Investors are only repaid if outcomes are achieved, thereby helping to share the risks traditionally borne by utilities.
Stormwater Credits	Property owners who implement green infrastructure to capture runoff are rewarded with discounts on their stormwater or other water service fees

Sources: Quesnel, Ajami, & Wyss (2016)

There also remains tremendous potential for State Revolving Funds to support financial innovation, particularly as it may pertain to decentralized and natural infrastructure solutions. The current strength of U.S. State Revolving Fund balance sheets affords many SRF programs the opportunity to expand financial assistance capacity to triple-A rated financial guarantees without diminishing the capacity of their highly successful loan programs. The highest use potential for such a product would be in partnering with public and private project sponsors of decentralized and natural infrastructure. Emerging models in this area rely on either market incentives for private investment by the establishment of price signals through regulatory regimes (i.e., stormwater fees that differentiate between pervious and impervious surfaces) or incentives provided by models that can tap into existing market mechanisms (i.e., pay for performance contracts). The availability of a highly rated financial guarantee can meaningfully reduce long term project capital costs, assure market access and facilitate project aggregation by effectively eliminating credit risk to off-take investors (EPA Financial Advisory Board, 2014).

INTERNATIONAL WATER FINANCE CHALLENGES & SOLUTIONS

International Water Finance Sources

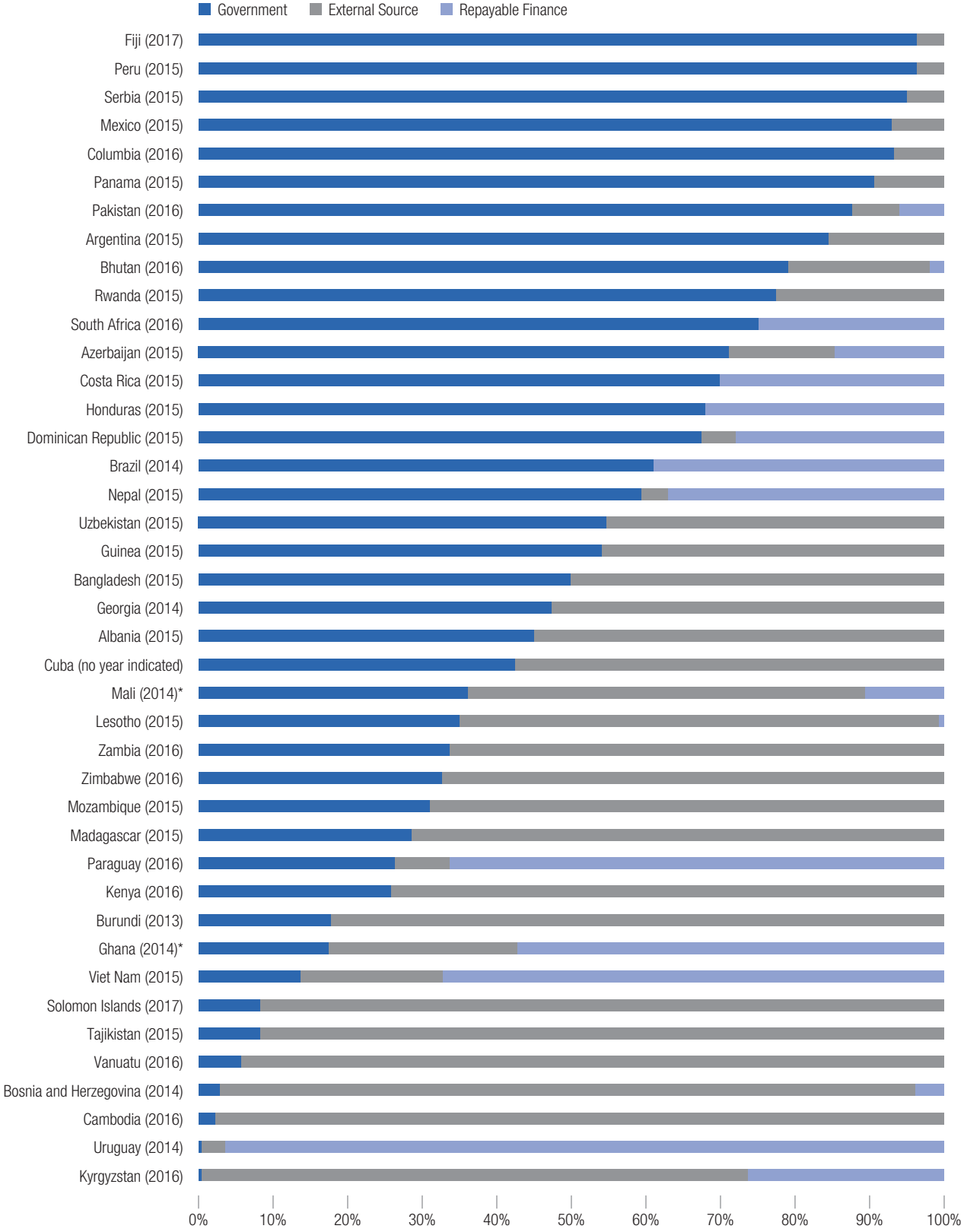
While developing water infrastructure is crucial for the well-being of any country in the world, there is not a single, best model for financing water (World Water Council, 2015). Different countries typically follow different methods to finance infrastructure projects, but the 3Ts, or Taxes, Tariffs, and Transfers, concept is one way of describing financing approaches in the water sector. In 2009, The Organization for Economic Co-operation and Development (OECD) developed the **3Ts** framework which categorized the three major sources of water financing available to countries: (1) **Taxes:** funds gathered from national, regional, or local level of government taxes; (2) **Tariffs:** funds obtained from fees placed on users of water, sanitation, and hygiene (WASH) services; and lastly, (3) **Transfers:** funds received from international donors and foundations in the form of grants, concessionary loans, or guarantees (Trémolet & Rama, 2012).

The 3Ts illustrate the cash flow used to finance "recurrent costs," i.e., operation and maintenance expenses of water projects, and "capital investments," i.e., investments used to acquire or upgrade physical assets (World Water Council, 2015). The 3Ts also enable intermediate forms of funding from repayable sources, which include loans, bonds, and equity used to meet short-term budgetary needs (Lago, et al., 2011). To establish a sustainable and effective financing framework for water projects in the future, countries must find the proper balance and relationship between the three ultimate sources of long-term funding.

In addition to domestic financing, external sources of funding are also significant contributors to financing water projects. Financial aid, or **official development finance** (ODF), to the water sector is also widely accepted and described using terms coined by the OECD as either: **official development assistance** (ODA): which describes aid provided by official agencies that has a minimum grant element of 25%, calculated at a discount rate of 10%; or **other official flows** (OOF): which are all other official sector transactions that do not meet the ODA criteria, and includes the use of instruments such as export credits and subsidies (OECD, 2017; Winpenny, et al., 2016).

As reflected in Figure 3, a significant portion of developing countries depend heavily on external funding sources for water and sanitation.

Figure 3: Breakdown of non-household sources of WASH financing (taxes, external sources, and repayable finance).



Sources: GLAAS 2016/2017 country survey; TrackFin, 2017 where indicated with an asterisk *

ODF from outside organizations are categorized under one of two categories: (1) **bilateral aid:** which describes aid transferred between two governments or countries; or (2) **multilateral aid:** which are funds provided from a group of countries or from a single institution that represents a group of countries (OECD, 2017). While the total ODA of both types of aid was relatively comparable in previous decades, increases in multilateral development funding in recent years has consistently placed it above bilateral forms of funding; multilateral aid has commanded over 60% of the total ODA since 2010 and peaked at 71% in 2011 and 2013 (Winpenny, et al., 2016). Even so, there are still substantial, on-going debates questioning the efficacy and use of one form of aid over the other (Gulrajani, 2016). Although smaller in total ODA when compared to multilateral aid, bilateral aid remains a large portion of total foreign aid to this day (Winpenny, et al., 2016).

Given the wide range of financial resources, both internal and external, available to countries to improve on drinking water and sanitation, it is critical that each resource be leveraged appropriately and as-needed to provide sustainable and lasting water solutions. The following sections describe in further detail the major sources of funding from U.S. government agencies, international financial agencies, and private sector that exist today.

U.S. Government Finance Agencies

In previous decades, the U.S. government has helped to finance water and sanitation-related activities worldwide. Spurred by global resolutions such as the **Millennium Development Goals** (MDGs) pledging to halve the proportion of people without access to safe drinking water and basic sanitation by 2015 (United Nations Children's Fund [UNICEF], 2014), and more recently as an update to the MDGs, the **Sustainable Development Goals** (SDGs) which aim to achieve universal and equitable access to safe and affordable drinking water and provide basic sanitation for all by 2030 (United Nations, 2017), the U.S. has been at the forefront of international projects to support water-related projects in many developing countries. As part of these efforts, the U.S. passed the **Senator Paul Simon Water for the Poor Act of 2005**, which has since fostered greater U.S. government funding for clean water and sanitation around the world (Natural Resources Defense Council, 2012). Since the bill was passed, appropriations for the Water for the Poor Act has steadily increased over time, most recently bringing the approved total allocation to $400 million for FY 2016 and 2017, the highest WASH appropriation in history (Millenium Water Alliance, 2016).

While there are many different U.S. agencies involved in implementing foreign assistance, the three leading organizations jointly working to implement the Water for the Poor Act are: the **U.S. Department of State** (DoS), which plans, reports, and provides oversight for activities; **U.S. Agency for International Development** (USAID), which is the leading implementer of water and sanitation programs abroad; and the **Millennium Challenge Corporation** (MCC), which, although similar to USAID in helping to provide financing for projects abroad, is focused on reducing poverty through economic growth. MCC operates by providing grants to countries that invest in removing binding constraints to economic growth. Therefore, strategic planning for expanding access to clean water and basic sanitation is jointly managed by the DoS and USAID, while implementation of designated efforts is handled by both USAID and MCC (Salaam-Blyther & Tiaji, 2012).

Most recently reported U.S. government investments in FY 2013 for international water-related activities exceeded $783.6 million, of which USAID invested $523.8 million for WASH, water resources management, water productivity, and disaster risk reduction activities, and MCC obligated $95.5 million for water projects (U.S. Department of State, 2014).

In addition to the major undertakings by DoS, USAID, and MCC, there are also 20 other U.S. government agencies and departments involved in providing technical and financial resources to countries abroad. Some of these agencies include: Overseas Private Investment Corporation (OPIC), U.S. Trade and Development Agency (USTDA), Export-Import Bank (EXIM), U.S. Geological Survey (USGS), USEPA, U.S. National Aeronautics and Space Administration (NASA), U.S. Department of Defense, U.S. Department of Health and Human Services, National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Agriculture, Centers for Disease Control and Prevention (U.S. Department of State, 2014; Oldfield, 2017). Examples of other assistance programs include: a $4.3 million investment in FY 2013 implemented jointly by USAID, USGS, and NASA to improve water management around the

world; and a $161 million obligation by the U.S. Department of Defense to repair Afghan water infrastructure (U.S. Department of State, 2014).

International Finance Institutions

In addition to funding from the U.S. government, other countries and international institutions have also contributed significant amounts in the past and have been stepping up their involvement in the water sector. The Development Assistance Committee (DAC), a group of 27-member countries that make up the OECD, is among the largest contributors to bilateral ODA financing. From 1995 to 2014, DAC contributed 66 percent of all ODA financing to the water sector, with an annual average contribution of $6 billion per country (Winpenny, et al., 2016). Among the top contributors were countries such as Japan, Germany, United States, France, and Netherlands. Additionally, international financial institutions (IFIs) such as multilateral development banks (MDBs) have provided abundant support for the water sector. Collectively, IFIs provided more than $8.35 billion and other international organizations such as UNICEF, United Nations Development Program, UN-HABITAT provided $33.16 million in funds for water-related activities in FY 2013 (U.S. Department of State, 2014). Contributions from key multilateral funders are listed in Table 4 below.

Table 4. Examples of IFIs that have provided ODA to the water sector, 1995 – 2014

Multilateral funders	Average ODA Commitment ($, 1995 – 2014)	Average OOF Commitment ($, 1995 – 2014)
World Bank - International Development Association (IDA)	920 million	–
European Union (EU) institutions	–	20 million
Asian Development Bank (ADB) Special Funds	234 million	610 million
African Development Fund (ADF)	212 million	90 million
Inter-American Development Bank (IADB) Special Funds	120 million	810 million
Islamic Development Bank (IDB)	85 million	270 million
Arab Fund (AFESD)	82 million	–
UNICEF	35 million	–
OPEC Fund for International Development (OFID)	76 million	10 million
Global Environment Facility (GEF)	58 million	–
International Bank for Reconstruction and Development (IBRD)	–	1.86 billion

Source: Table recreated from Aid Flows to the Water Sector (2016), by Winpenny, et al.

Private Sector

Compared to the transportation and energy industries, the water sector has seen very little private investment in the past. In the United States, private participation in the water/wastewater sector is about 12%, which reflects the continued dominance of public sector ownership and operation of water systems (Blackstone, 2017). Although the private sector role remains small relative to public sector, the amount of infrastructure investment is significant. For example, six of the largest private utilities in the U.S. collectively invest $2.7 billion annually, which is comparable to the total annual expenditures from the U.S. EPA's drinking and clean water SRFs. Globally, in 2015, water only captured 4% of the total private sector infrastructure commitments whereas transport and energy garnered 63% and 34%, respectively (Kolker, Kingdom, Trémolet, Winpenny, & Cardone, 2016). The idea of "water as a financial risk" remains a predominant part of the private sector's attitude towards investments in water, and as a result has not brought a lot of private funding into international water programs as many would have liked (Jägerskog, Lexén, Clausen, & Engstrand-Neacsu, 2016).

Philanthropic Organizations

Nongovernmental organizations can also supplement funding from domestic, foreign, and private sector sources. Although donations may be smaller in size when compared to other sources, grants made by philanthropic organizations have nonetheless provided valuable funding for key water and sanitation projects throughout the world (Table 5). Moreover, philanthropic organizations represent important laboratories for developing and accelerating dynamic new solutions to complex development finance challenges, (i.e., the Rockefeller Foundation's major commitment to innovation in financing).

Table 5. Examples of philanthropic organizations that have provided grants to the water sector, 2001 – 14

Organization	Total amount granted ($, 2001 – 14)
The Bill & Melinda Gates Foundation	655.3 million
Conrad N. Hilton Foundation	126.7 million
The Coca-Cola Foundation, Inc.	104.1 million
Howard G. Buffett Foundation	76.2 million
Queen Elizabeth Diamond Trust	62.3 million
The PepsiCo Foundation, Inc.	46.8 million
Caterpillar Foundation	23 million

Source: Table recreated from Aid Flows to the Water Sector (2016), by Winpenny, et al.

Key Obstacles to Meeting the International Water Finance Gap

To achieve the goals stipulated in the SDG of providing access to basic water, sanitation, and hygiene services to the rest of the world will cost approximately $28.4 billion per year from 2015 to 2030 (Hutton & Varughese, 2016). While there are number of sources of domestic, foreign, and private funding that can be leveraged by governments around the world, there are still multiple barriers that prevent many from adequately closing the finance gap.

In many countries, there is a shortage of financial resources despite growing international sources of funding, increasing domestic budget allocations, and having self-defined national targets (UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water [GLAAS] 2017 Report, 2017). For example, meeting the SDGs is expected to cost about three times the current global investment level (Hutton & Varughese, 2016). Further, 80% of countries have already reported that they have insufficient funds to meet their own national standards—which are lower than SDG standards (GLAAS, 2017). Financing water services across the world will require significant reinvestment on behalf of each country into their own services.

Other barriers to international water and wastewater financing include:

(1) **Weak ability of water providers to recover their operations and maintenance costs.** Even though many service providers have access to government subsidies, almost 20% of countries report that there is not a financial mechanism available that allows them to recover the financial costs of providing those services (GLAAS, 2017). This has resulted in the deterioration, loss of efficiency, and increased failure of water systems in many countries.

(2) **Lack of creditworthy or reliable service providers.** Despite the availability of domestic and foreign funding sources, financing that has been provided to certain water service providers or projects may or may not be effectively utilized completely. The challenge is how to increase the creditworthiness of water/sanitation utilities so that they can access local commercial financing sources. This would be a gradual process of moving up the ladder of creditworthiness. Domestic and foreign aid funds for water projects have absorption rates of 54-60% and 38-48% respectively (Oliver, Mazza, & Wang, 2016).

(3) L**ack of data for informed decision-making** has been a major issue for all stakeholders involved in allocating resources for water and sanitation-related activities (GLAAS, 2017). While financial data is gradually improving, with nearly 70% of countries indicating use of such data in decision-making processes, there is less information about whether the financial plans and budgets are being consistently followed and implemented (GLAAS, 2017). Credit ratings can also be a helpful source of data and information to support lending.

(4) **Uncertainty about the sustainability and availability of future funding.** Even though external funding has been increasing in recent years as discussed in previous sections, there have been serious fluctuations in the year-to-year amounts of aid provided by both large and small institutions alike (Winpenny, et al., 2016). Tariffs are the most reliable source of funding. A lack of long-term sustained sources of funding have also made financing large projects even harder (World Bank, 2015).

Governance: The Key to Unlocking Water Finance

"Governance" is the primary common denominator that can either limit or enable sufficient flows of financing to the water and wastewater sectors, be it in the United States or anywhere else in the world. Whether it is fragmented, incoherent policymaking structures across federal or state/provincial levels, dysfunctional local authorities, or poorly managed and equipped water providers, weak governance is at the core of most barriers to water finance. Moreover, governance failures also tend to aggravate other complex challenges, such as terrorism, organized crime, migration, environmental degradation, and healthcare, among others.

The main challenges that face the water sector are not always or necessarily a lack of technologies, data, science, or even money. It is often the need to break down institutional silos and foster greater inter-institutional collaboration. Solving domestic and global water challenges requires greater focus on creating the systems to better enable project preparation and development, rather than simply focusing on infrastructure projects alone. This means looking beyond traditional "hardware" (i.e., infrastructure) solutions and putting greater emphasis on "software" solutions, such as behavioral changes, improved governing systems, and stakeholder engagement.

In other words, focusing on good governance is the key to unlocking water finance and to better tackle other significant development challenges. Thus, public and private water sector players would do well to collaborate more closely with others that are working to strengthen the fundamentals of good governance, such as the rule of law, judicial reform, property rights, democratic processes, transparency, financial disclosure, media access and integrity, and public participation in decision-making.

Likewise, while top-down federal approaches may have been useful in past development of water and wastewater systems, perhaps the greatest need now is to foster closer coordination and open collaboration at local, state, and regional levels.

Key Solutions & Tools to Close the Gap

U.S. Government Programs and Tools

The U.S. government agencies offer several programs that can help to alleviate financial hardship and close the gap for many international water service providers. The **U.S. Agency for International Development (USAID), and Millennium Challenge Corporation** (MCC) both provide ways through which international funding can be obtained and allocated. Budgets for WASH, water resources management, water productivity, and disaster risk reduction are allocated every year by USAID (USAID, 2013). Further, MCC provides investment and resources to countries dealing with issues related to water, sanitation, and irrigation (MCC, 2017). Other U.S. government agencies and departments such as USGS, USEPA, USDA, NASA, and NOAA have also been responsible for investing in water projects abroad (U.S. Department of State, 2014; Oldfield, 2017).

Donor Coordination

More prevalent use of donor coordination in host countries can enable more efficient allocation of aid resources, keep transaction costs low, promote cooperation between stakeholders, and generate incentives for better policy choices (Leiderer, 2015). A concept developed in the early 1990s, **Sector-Wide Approaches** (SWAps) has been an effective method to bring together and establish more transparent relationships between government, donors, and other stakeholders in a region (World Health Organization, 2017). Despite being a long-standing approach, the method has continued to be a popular choice of method to reduce fragmentation while promoting harmonization in countries around the world (Peters, Paina, & Schleimann, 2012).

International Finance Institutions

International Finance Institutions (IFIs) represent a significant portion of international funds being invested in the water sector. The World Bank has played a significant role as an innovator and focal point in advancing water and sanitation finance solutions. In 2015, MDBs and International Monetary Fund (IMF) announced that they would invest more than $400 billion over the next three years to meet the SDG agenda (International Monetary Fund, 2015). Further, bilateral aid from countries or organizations such as the OECD DAC contributes to bilateral ODA financing. Collectively, IFIs can influence change in developing countries not only through providing direct aid, but also by incentivizing and mobilizing private finance in local markets which is more sustainable in the long-term (World Bank, 2015).

Developing Country Tools to Mobilize Local & Foreign Sources of Capital

Developing countries must work on creating stable and predictable policy frameworks to not only attract foreign and private sources of capital investment, but also enable sustainable, well-designed projects (Corfee-Morlot, et al., 2016). Providing supporting and inclusive political environments for PPPs can also help significantly to secure private engagement in developing countries, which serve to further reinforce investor confidence and increase scale of projects in the future (Corfee-Morlot, et al., 2016). Community based PPPs (CBP3s) can also be good models and tools for developing countries and help them leverage both private and philanthropic monies in meeting their water resources and sanitation needs and goals.

Blended financing refers to the use of funds from different sources to create a single tailored solution for constructing multi-purpose infrastructure (World Water Council, 2015). This mechanism has shown great promise in recent years to mobilize local and foreign sources of capital more effectively. It can help to bridge the gap for high impact projects that have initially high perceived risks and/or costs, but can be commercially viable over time (Gonzalez, 2015; World Water Council, 2015).

Private Investor Solutions

Although private investment in the water sector so far has not been significant due to perceived high risks, lack of a proven track record, and small earnings paired with slow rates of return (Musick & Petz, 2015; Leonard, 2015), PPPs are slowly gaining momentum as the market matures. Currently, there are more than 2,000 water and wastewater facilities in the U.S. that are designed as PPPs, but there is potential for more (Ernst & Young, 2013). With limited public funding, local utilities and municipalities are starting to consider PPPs for a much-needed boost in capital (The Johnson Foundation, 2012). Additionally, CBP3s, a much more attractive model for public utilities, have also started to gain traction as social, political, and economical incentives for local communities are established as deliverables in the new contract type. Given the success of several CBP3s in development currently, private investors should be poised to take advantage of these long-term, relational contracts in the future which are highly rewarding for both parties involved.

Examples of Innovative Public-Private Partnerships and Financing Approaches

As one of the first CBP3s implemented in the United States, the **Clean Water Partnership** in Prince George's County, Maryland, is a great example of a successful PPP between Prince George County's Department of Environment and Corvias Group LLC, their private partner (Prince George's County Department of the Environment, 2016). By selecting a single long-term private sector partner to be the program manager of a $100 million effort to construct stormwater retrofits, the Prince George's has streamlined and accelerated the timeframe of project delivery, at the same time promoting opportunities for innovative green technologies, reducing financial risks to the utility, and creating local job, education, and community outreach opportunities for the County (Prince George's County Department of the Environment, 2016). Further, remuneration in the form of pay-for-performance will also ensure that stormwater retrofits are up to par and that the County's private partner is held accountable for all phases of project delivery in the program (Prince George's County Department of the Environment, 2016).

The **Environmental Impact Bond** introduced by DC Water in partnership with its private investors, the Goldman Sachs and Calvert Foundation, is another example of an innovative PPP model. Proceeds from the sale of the bond are being used to finance the construction of green infrastructure in Washington, D.C. neighborhoods, while private investors are repaid over time, based in part on the performance of the constructed green infrastructure 4.5 years later (Valderrama, 2016). Construction of additional green infrastructure will help to control the amount of contaminated water that flows into the city's waterways during intense rainfall events. Further, increased investments can help support local economic development by creating jobs for people interested in green infrastructure construction and maintenance.

Lastly, the **Forest Resilience Bond** program initiated by Blue Forest Conservation in partnership with World Resources Institute (WRI), American Forest Foundation, and several other stakeholders, is planning to introduce a pilot bond soon to fund forest restoration projects (Blue Forest Conservation, 2017). The bond is used to generate funds from private investors to finance forest restoration projects; and following the projects' completion, will repay its investors over time for their principal plus interest, from monies received from pay-for-performance contracts with the projects' beneficiaries (Ozment, et al., 2016). While this bond is offered by an end-to-end service provider, Blue Forest Conservation, it can also attract private investment through cost-sharing methods garnered from public utilities.

THE WAY FORWARD

Recommendations for U.S. Policymakers

- **Establish a comprehensive, integrated, and strategic approach grounded in robust, bottom-up collaboration.** As noted previously, the lack of policy coherence is a primary barrier to investment in the water sector. The federal government should take the lead by elevating the priority of water and leading a collaborative, bottom-up strategic planning process involving relevant U.S. government agencies, state and local authorities, tribal authorities, the private sector, and civil society organizations. This means breaking down existing silos and ensuring effective coordination across the water sector. A number of promising ideas have been put forward for action at the federal level, which include the following:
  - Issue a Presidential Policy Directive (PPD) for an integrated and effective water infrastructure policy and strategy.
  - Establish a Presidential Commission on Water Infrastructure Policy Coordination and Security or a similar inter-agency coordination mechanism to evaluate and create a coordinated, rational, and efficient water infrastructure policy and a process for administration.
  - Appoint an Assistant to the President for Water Policy and Security.
  - Incorporate water security as a priority in the National Security Strategy.
  - Complete the congressionally-mandated Global Water Strategy by October 2017.
- **"Demystify" the priorities and authority of U.S. government agencies related to water.** Beyond establishing the above-noted strategic framework for policymakers, it is important to proactively engage the private sector to get direct inputs about the characteristics of projects, financing institutions, and risk reduction tools that might raise private sector interest in investing.
- **Encourage formation of, and participate actively in, a U.S. water finance exchange or "hub."** This would bring public and private water operators together with financial institutions (public and private) to help fill the information gap by effectively linking water operators with sources of finance and better enable water operators to collaborate on procurement. The U.S. EPA's recently launched "Water Finance Clearinghouse" and Stanford University's "Living Map of Innovative Water Financing Mechanisms in the United States" represent a significant and exciting development that can lay the groundwork for knowledge sharing and peer-to-peer learning opportunities. They will be integrated into our work, but no comprehensive efforts yet exist.
- Encourage formation of, and participate actively in, a U.S. water finance exchange or "hub." This would bring public and private water operators together with financial institutions (public and private) to help to fill the information gap by effectively linking water operators with sources of finance and better enable water operators to collaborate on procurement. The U.S. EPA's recently-launched "Water Finance Clearinghouse" is a significant and exciting development that will be integrated into our work, but no comprehensive efforts yet exist.
- Increase public outlays in water and wastewater infrastructure. Budgets are a reflection of priorities. The United States cannot close its annual water investment gap of $82 billion without allocating greater resources in public budgets and using its policy levers to unlock the vast resources of our capital markets. At a minimum, the federal government should:
  - Significantly increase congressional appropriations for State Revolving Funds (SRFs) and enable private sector participation in SRF projects.
  - Increase the funding and revisit priorities for the Water Infrastructure Finance and Innovation Act (WIFIA) Program.
  - Fund the U.S. Army Corps of Engineers Public-Private Partnership Demonstration Program.

- **Reduce risks to incentivize increased private investment.** Availability of capital is not the problem. Institutional barriers, weak governance structures, a lack of transparency, and inconsistent tax policies present risks that discourage private investors. Federal and state authorities should, as appropriate:
  - Develop a water workforce for the 21st century through deployment of the "Blue Wave" program and other capacity building efforts that strengthen the technical, managerial, and financial acumen of water operators, particularly those in rural and small systems;
  - Require water utilities and operators to fully account for total costs and address the pricing of water to reflect the full costs of its provision;
  - Revamp existing procurement systems to expand the successful use of a broad range of water delivery models that involve both public and private sector actors;
  - Promote the bundling and consolidation of investment opportunities in smaller and rural systems;
  - Remove the volume cap on private activity bonds (PABs); and
  - Grant greater flexibility to the states to make use of unliquidated obligation balances to provide an additional source of funding for projects.
- **Develop a unified water data and information network.** Open, available, and secure data is crucial to breaking down institutional silos and to enhancing accountability and transparency at all levels of implementation. Such a network would promote more cohesive planning and development among water stakeholders.
- **Accelerate the innovation and adoption of new technologies.** The federal government should:
  - Establish and capitalize a "National Innovation Fund," through matching grants with state, not-for-profit and private capital. The focus of the funds' mission would be to advance water technology development by de-risking early stage water utility procurements;
  - Establish a "National Test Bed Network" composed of a coordinated network of universities, laboratories, regional incubators, test bed facilities, and national research foundations to validate emerging technologies at scale and facilitate faster adoption by utilities; and,
  - Enact regulatory reforms to promote adoption of better infrastructure technology.

Recommendations for International Finance Institutions (IFIs) and Other Donors

- **Continue to elevate water as a priority.** The international community took a significant step to elevate water as a priority in September 2015 when world leaders adopted the UN's 17 "sustainable development goals" (SDGs). This included SDG 6, to "ensure availability and sustainable management of water and sanitation for all" by 2030. Progress on water and sanitation is crucial to achieving other SDGs (i.e., poverty reduction, health, education, gender equality, sustainable cities, etc.).
- **Continue to boost stronger coordination of policymaking among water and finance authorities.** IFIs such as the World Bank and International Monetary Fund have already taken steps to boost integration of water and sanitation into broader development finance proceedings. By working with the Sanitation and Water for All (SWA) partnership to incorporate High-Level Meetings of finance and water sector ministers as part of their April 2017 Spring Meetings, the World Bank and IMF demonstrated the importance and utility of putting water squarely in the forefront of IFI engagement.
- **Focus on catalyzing and evaluating projects which employ innovative approaches and technologies.** The best way to encourage partnerships at the country level is to facilitate projects using new techniques and technologies. This helps showcase the value of innovative approaches, and increases the prospects that these new ideas will be funded and replicated.

- **Look beyond traditional "hardware" (i.e., grey infrastructure) solutions and boost emphasis on green infrastructure and "software" solutions that strengthen fundamental governance capacities.** Development assistance oriented to promoting stronger rule of law, transparency, procurement reform, stakeholder participation, property rights, judicial reform, and managerial/technical capacity building is vital to creating the enabling environments necessary to increase both public and private investments in water and wastewater. Moreover, sector-specific capacity building related to improving the collection, management, and use of water use data and utility performance metrics is key to bolstering the creditworthiness of water and wastewater service providers.
- **Where appropriate, take a stronger role in leading in-country donor coordination.** Given the multiplicity of bilateral and multilateral development assistance entities and private donors engaged in water and wastewater sectors around the world, donor coordination remains an ongoing challenge, yet a vital necessity to avoid duplicative efforts and to optimize potential synergies. Resident representatives, particularly those from regional IFIs, are often particularly well-placed to play a leading role as a convener and facilitator for in-country coordination among donors.

Recommendations for Developing Countries

- **Create and maintain stable and predictable policy frameworks as part of a broader commitment to rule of law.** Water infrastructure and related investments are long-term propositions. In an era of increasingly tight public monies, the attraction of private capital from both domestic and foreign sources is crucial to advance water and sanitation development. Accordingly, "policy predictability" is a top investor concern. Public authorities can best address such concerns by conducting transparent and consultative rulemaking and policy reform processes that involve stakeholders at all levels, including the private sector. They should also maintain effective, transparent, and objective dispute resolution mechanisms and processes;
- **Signal government commitment and a "whole of government" approach to water and wastewater infrastructure development.** Such signals are crucial to reassure prospective investors of a government's long-term political commitment to develop water and wastewater systems. The OECD has stressed that "securing necessary resources for infrastructure development, and making infrastructure networks attractive for private participation, are made easier when infrastructure policy priorities and medium to long-term goals are clearly stated and fully embedded in the country's economic development strategies" (OECD, 2015). This points to the need for comprehensive national infrastructure plans, laying out a credible pipeline of infrastructure projects (including the bundling of small projects, where appropriate), communicating priorities and roles expected from both the public and private sectors, and forecasting costs, including those for short-term and long-term operation and maintenance.
- **Maintain a level competitive playing field.** This is a particular concern in a sector historically dominated by state-owned utilities. Strong corporate governance standards should be applied equally to state-owned and private enterprises to maintain a healthy competitive environment and reduce investor concerns about the potential risks of arbitrary and capricious rulemaking.
- **Undertake transparent and robust stakeholder engagement to balance affordability and cost-recovery in setting water tariffs.** Few issues are as politically volatile as the matter of price-setting for essential public services such as water. At the same time, the provision of clean water and sanitation services is not cost-free. Any enterprise that does not maintain sufficient revenues to cover its full costs is not sustainable. Water and wastewater service providers must be able to meet not only immediate operational needs, but also invest for long-term system operation, maintenance, and improvements. Including consumers, service providers, and eventually private capital market participants and other stakeholders in proactive and transparent rate-setting processes is vital to meeting both affordability and cost-recovery needs. Ideally, this means empowering regulatory agencies that are independent from line ministries and service providers and that have clear lines of authority and accountability.

- **Invest in data collection and management and information sharing.** Many water utilities do not collect data on services, system performance, and reliability. As a result, policy decisions can often be made in a vacuum, with limited supporting data and analyses. Moreover, the lack of data impairs their ability to raise capital. Investing in the collection, analysis, management, and publication of relevant data is fundamental to the enhancing the financial viability and creditworthiness of water and wastewater providers.
- **Develop and publish long-term investment plans to promote greater financing from institutional investors.** Institutional investors, such as pension funds, insurers, and sovereign wealth funds, can offer an important source of potential capital, as their long-term investment horizons can line up well with the nature of water and wastewater infrastructure developments. National governments should refer to the "G20/OECD High-Level Principles of Long-term Investment Financing by Institutional Investors" for guidance on specific actions that could unlock capital from institutional investors, particularly domestic sources.

Recommendations for Private Investors

- **Share information to make transparency a two-way street.** Asymmetries in information can hamper the functioning of markets. Where appropriate, investors should boost procurement reforms by sharing information on the extent to which their investment strategies are in line with their investment horizon, how they address long-term risks, and other considerations that could better inform policymakers of the parameters that may affect investor decisions.
- **Implement projects.** Work together with key public institutions to generate and evaluate projects. Prove what works and be honest about and learn from what does not work.
- **Support the use of innovative technology.** Partnerships that apply innovative approaches and technologies as key factors in improving sustainability and cost effectiveness of water systems. Encourage the development of financing instruments to support these innovations.
- **Collaborate with each other and likeminded public officials to advance institutional reforms.** "Traditional" ways of doing business and entrenched oligarchs can thwart the most well-intentioned efforts to modernize institutions, boost professional capacities, or enact procurement reforms. Private investors, even those with a strong in-country presence, can seldom overcome such challenges when acting alone. However, banding together with each other and with likeminded public officials (i.e., reformist crusaders in legislative, executive, or judicial branches) can generate the clout necessary to achieve fundamental improvements in governance and thus investment climates. Moreover, in some instances, bringing private sector actors into the sector can give local officials the "cover" needed to overcome hurdles and impose the discipline needed to resolve long-standing governance/investment issues that local authorities have been unwilling or unable to confront.
- **Demonstrate genuine good corporate citizenship.** As water represents a public good, consumers in much of the world view water as free entitlement or, in some instances, a "gift from God." This can engender public resistance to private investment in the water sector. For example, some communities in the United States have seen support for private engagement collapse as soon as utilities or the public realize that a firm could "profit" from water. Taking an active and public role as constructive corporate citizens can better enable private firms and investors to build the trust and understanding necessary for public education campaigns to effectively reduce resistance to private water investments.

Elevating Water as a National Security Concern

Since its launch in March 2012, the U.S. Water Partnership (USWP) has been implementing the vision of working together for a water secure world. Recognizing that water security cannot be achieved without a significant increase in investments in infrastructure, technology, and capacity building, USWP embarked in late 2016 to harness its broad network of public and private sector experts to examine the factors that have hampered water investment and to identify practical steps that can be taken by relevant actors to mobilize the enormous sums of capital required to achieve a water secure world. This included a review of extensive existing literature produced by international finance institutions, U.S. agencies, and private sector organizations, as well as the conduct of multiple expert roundtables between February and June 2017.

The USWP is also working with a number of organizations and investors on generating projects in the water sector and is very focused on catalyzing projects and partnerships, both domestically and globally. This overview synthesizes much existing thinking and analysis in the sector and puts the major issues and challenges into context. This document is designed to help provide a good entry point for entities interested in partnering and understanding the water finance space and will help guide the USWP partnership-oriented efforts going forward.

This report contains the key challenges we have identified and a set of recommendations that the USWP, ReNUWIt, Water in the West and other partners believe are critical to unlocking water finance quickly and significantly.

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