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FINANCIAL INNOVATIONS

FOR RURAL WATER SUPPLY IN LOW-RESOURCE SETTINGS

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ACRONYMS AND ABBREVIATIONS

DIB	Development impact bond
GWCL	Ghana Water Company Limited
JMP	Joint Monitoring Programme for Water Supply, Sanitation and Hygiene
OECD	Organisation for Economic Co-operation and Development
REAL-Water	Rural Evidence and Learning for Water
RWSN	Rural Water Supply Network
UN	United Nations
UNICEF	United Nations Children’s Fund
USAID	United States Agency for International Development
VSLA	Village Savings and Loan Associations
WASH	Water, Sanitation, and Hygiene
WHO	World Health Organization

EXECUTIVE SUMMARY

CHALLENGE

Globally, the Sustainable Development Goals (2015–2030) are driving efforts to increase water service levels, while ensuring that services are affordable and no vulnerable population is left behind (United Nations 2018). In concert with global development goals, the United States Agency for International Development (USAID) Rural Evidence and Learning for Water (REAL-Water; 2021–2026) program focuses on identifying ways to expand water access and safety in rural areas of low- and middle-income countries. Rural water supply financing poses special challenges, as the populations are smaller, more dispersed, and poorer than their urban counterparts. This may reduce opportunities for economies of scale and complete cost recovery. As of 2020, the majority of people lacking even basic water services (i.e., water from a protected source requiring no more than 30 minutes to collect) lived in rural areas (WHO UNICEF Joint Monitoring Programme (JMP) 2021).

REPORT OBJECTIVES

This report aims to provide an overview of financing or funding mechanisms or applications related to water service that are innovative (i.e., not yet commonplace) and promising (i.e., show potential for benefits exceeding the status quo) in rural areas such as small villages and dispersed settlements. It highlights categories of novel financial concepts that might offer a greater range of options to government agencies, donors, practitioners, and communities who develop and manage rural water supplies. The concepts may have sufficient merit to warrant further exploration within later stages of REAL-Water or other implementation research programs; however, the REAL-Water consortium does not endorse or relatively rank specific topics or service providers¹. Financial choices should be weighed relative to one's local setting and context. We summarize the information to evaluate conditions and trends in rural water financial innovation, leading to overarching recommendations.

INNOVATION SYNOPSES

I. VILLAGE SAVINGS FOR WATER

Community-based savings and credit associations offer rural dwellers in low-income settings an opportunity for member-only access to loans, emergency support, and small annual investment returns. With abundant existing savings groups in sub-Saharan Africa and India, the mechanism has been leveraged in some cases to improve financial management of rural water systems. They offer a framework for creating dedicated, affordable, and transparent savings funds to pay for high-quality maintenance and repairs. Groups may dissolve over time, though, and require periodic external support. Field results from **limited-scale** water initiatives in several African countries have maintained an above-average reserve fund to support water point maintenance, repairs, or upgrades.

¹ The authors have not independently reviewed the validity or performance of specific financial products or service provider claims described in this report; thus, the information is provided solely for reference. The examples provided are not exhaustive. New organizations come onto the market or merge regularly, and existing organizations continually upgrade their product and service offerings.

2. DIGITAL FINANCIAL SERVICES

Digital financial services have penetrated many aspects of daily life, including water services. Prepaid metering of automated water dispensing devices and postpaid digital water service accounting provide benefits for both water system operators and customers, improving fee collection consistency as well as convenience. They may likewise simplify subsidy delivery to vulnerable customer segments. Converting to digital payment brings some hurdles, such as added transaction fees and costly startup infrastructure. Local training support and social inclusion outreach could benefit digital service expansion. **Limited rural deployment** is ongoing in Africa, Asia, and Latin America.

3. WATER QUALITY ASSURANCE FUNDS

To reduce the risk of newer markets such as rural water supply testing services, work agreements can be “guaranteed” by external parties, who ensure on-time payment. Creating an assurance or reserve fund efficiently leverages development aid as backstop for mostly self-sufficient local business arrangements. Should debt arise, the upfront account can be mobilized quickly. One primary example is a novel water quality testing assurance fund that allows larger professional laboratories to provide low-cost, centralized monitoring services to smaller rural water systems. This improves efficiency and incentives for wider-scale testing, but requires some implementation oversight and quality control. Interesting **pilot** examples come from a few African countries..

4. PERFORMANCE-BASED FUNDING

Repayable water supply investments often risk losses, due to the pervasive challenges of serving low- and middle-income rural settings. Performance-based funding is designed to maximize accountability and efficiency of the service provider. Its elements generally include: (a) targets and/or ceilings of repayment, (b) an agreed per-unit payment amount for each output and/or outcome (e.g., new household water connection), and (c) independent verification of results prior to payment disbursement. This type of mechanism can accelerate innovation and efficiency if designed well and if service providers are motivated to participate. Encouraging water-related examples have emerged on a **limited scale** in Asia, Africa, and Latin America, although this approach may not offer advantages under all circumstances.

5. DEVELOPMENT IMPACT BONDS

One type of performance-based funding is a development impact bond, which moves some risks from service providers and primary donors to a third-party investor, while rewarding water development outcomes. After designing a funding arrangement, the social investor gives the service provider added capital for planned activities. Once outcomes are verified, the primary donor (outcome funder) reimburses the other investor, adding interest or subtracting losses depending on outcome achievement. When designed and executed successfully, development impact bonds should drive efficiency and accountability, supported by data collection and performance management systems that allow desired outcomes to be accurately measured. No development impact bonds are yet in place for rural water supply, but one is being **piloted** for rural sanitation in Cambodia.

6. STANDARDIZED LIFE-CYCLE COSTING

Sustaining service delivery for rural water supply depends on accounting for all costs (including operations, repairs, and maintenance) over the assets' lifespan. As one element of asset management, life-cycle costing tools allow visualization, comparison, and targeted fundraising to better match anticipated costs. Consistent guidance on a life-cycle costing approach has been proposed for rural water supply, consisting of six cost categories, although it is not universally or easily performed by under-resourced service providers. As a result, the practice has seen **limited application** and data sharing in low- and middle-income countries, such as Vietnam, India, and Ethiopia.

7. BLENDED PUBLIC/PRIVATE FINANCE

Water supply development has traditionally relied on public or aid funding, rather than commercial financing. "Blended" finance refers to leveraging public funds (e.g., concessional loans or grants from national governments or development banks) to mobilize additional capital from private banks or investment groups. While not nearly as widespread as it is in other sectors (such as energy), this approach is growing in popularity, especially for attractive investment recipients such as well-run urban water utilities. For rural water supply, **limited applications** have taken root in Madagascar, Benin, and Senegal.

FINANCING MODELS AND TRENDS

Scaling successful rural water financing models cannot ignore interdependencies with technical, social, and managerial factors. Funding is necessary to both implement new infrastructure, and ensure it is maintained, operated, and renewed when needed. Factors affecting financial sustainability include legal agreements, local commitment, financial and technical capacity, institutional oversight for performance accountability, data flows for monitoring, and networking among small rural water supply organizations to promote learning and improvement opportunities. Social inclusion and service consolidation efforts can help ensure water supply development equitably benefits vulnerable populations. In the long run, water service providers should competitively adapt to increase service levels, respond to consumer demand, and drive up the perceived value of improved water delivery.

RECOMMENDATIONS

All innovation categories described herein hold promise for advancing rural water supply efforts in low-resource settings. At the same time, financial innovation benefits from continued implementation research, marketing, and coordination to improve performance outcomes. The innovations may render benefits only under favorable conditions, where accountability, transparency, motivation, and reward structures support effective planning and implementation. External support needs may span lengthy time scales. To better facilitate financial innovation that serves rural water consumers in low- and middle-income countries, we offer several recommendations:

- **Development finance institutions and governments** should encourage blending public and private investment in attractive water supply opportunities, while directing concessional lending, grants, and revolving loans to settings where commercial returns are less likely.

- **Development finance institutions** should build performance incentives into financing and funding schemes if they are likely to translate to practice improvements and tracking is not overly burdensome.
- **Governments, service providers, and nongovernmental organizations** should begin establishing networks to better coordinate and pool risks and opportunities for small rural water supplies.
- **Governments, service providers, and nongovernmental organizations** should use robust planning to properly assess the lifecycle costs, as well as non-monetary benefits, of new rural water supply schemes.
- **Service providers and nongovernmental organizations** should ensure they have ongoing mechanisms to share progress with consumers and understand and respond to consumer needs.
- **Service providers, nongovernmental organizations, and researchers** should share data on project or program implementation costs whenever such reporting is feasible.
- **Nongovernmental organizations** should avoid installing new infrastructure in the absence of a clear plan for locally sustained operation and maintenance funding.
- **Nongovernmental organizations** should emphasize building local capacity for rural water system financial management, for example through periodic technical assistance, to help sustain service effectiveness over time.
- **Researchers** should rigorously evaluate mid-term and long-term results of varied rural water financing programs, to enable learning and innovation over time.
- **Professional networks** (e.g., the Rural Water Supply Network) should ensure consistent global guidance is communicated to local institutions, and collate local experiences to provide a feedback loop to larger-scale institutions (e.g., regarding funding priorities).
- **Professional associations and learning institutions** should ensure water professionals can access opportunities to gain water supply financial management skills, and ultimately receive recognition and compensation for their services.
- **All parties** should consider how water supply programs can be adapted to address potential future risks (e.g., demographic or climate shifts), and invest in approaches resilient to multiple water supply and demand scenarios.

INTRODUCTION

WHAT IS REAL-WATER?

REAL-Water (2021–2026) is an initiative of the United States Agency for International Development (USAID). The Aquaya Institute leads a seven-member consortium that aims to help policy makers, development partners, and service providers make strategic decisions and implement good practices for rural water management through evidence and learning. REAL-Water supports coordination with other USAID programs contributing to the USAID Water for the World Implementation Research Agenda, to bolster global efforts toward achieving the United Nations’ (UN) Sustainable Development Goal 6 on “water and sanitation for all.”

The three main components of REAL-Water are:

1. Implementation research that applies scientific methods, international collaboration, and rigorous analyses. Focal countries for field research include Ghana, India, Kenya, Tanzania, and Uganda. Three focal research topics are:
 - a. Improving management performance for rural water service delivery
 - b. Strengthening water safety management
 - c. Improving planning for water resources
2. Use of evidence to support decision-making by national policymakers and government officials, development partners, and public and private sector service providers.
3. Coordination and collaboration with related programs contributing to the WASH knowledge base.

“Innovation” represents a cross-cutting theme that spans all aspects of the REAL-Water program. This report and the 2022 companion report on technological innovations set a stage for identifying and integrating innovative approaches into rural water supply implementation research.

HOW IS RURAL WATER SUPPLY FUNDED?

Specific governance and financial structures supporting rural water supply vary widely among geographic settings. Urban water supplies are typically managed by public utilities or private companies contracted for construction, operations, and/or maintenance. In low-income settings, nonprofit groups may provide services to fill access gaps. Some smaller-scale, more profit-driven schemes may exist, particularly for packaged water. Figure 1 illustrates general financing flows among actors in rural water funding schemes.

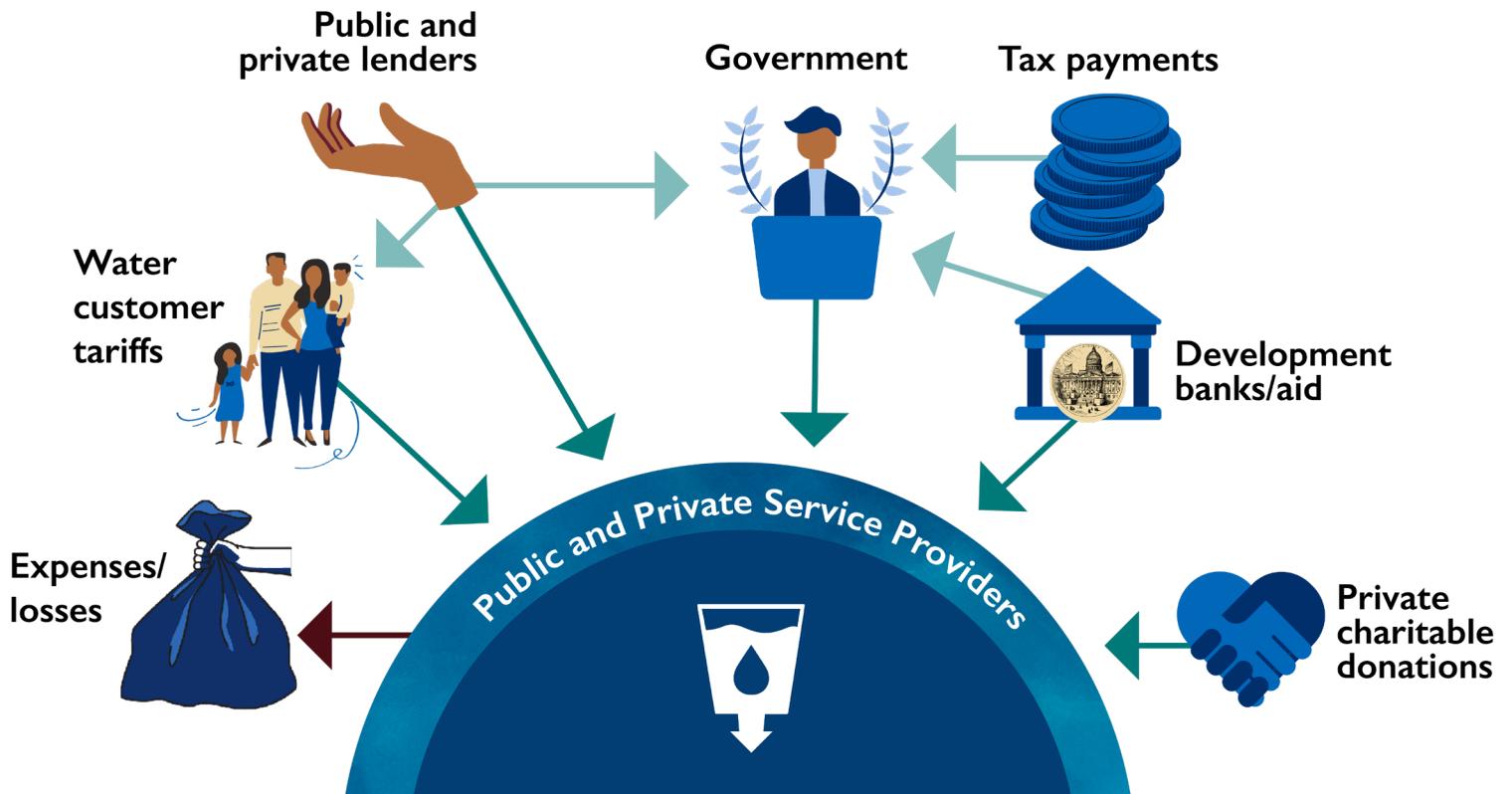


Figure 1. Simplified diagram of common rural water supply financial flows. The green arrows indicate cash inflows, and the red arrows indicate cash outflows. The transparent arrows show cash flows between actors. (Source: Vanessa Guenther, Aquaya Institute)

Funding for water supplies typically comes from a combination of user fees, tax revenue, and development assistance transfers from donors such as other governments, foundations, or nongovernmental organizations (WHO 2017b; Danert and Hutton 2020; Savoy 2022). The main source of revenue usually comes from water user fees, also called “tariffs,” wherein residential, commercial, and agricultural customers pay a fixed or flexible rate (e.g., by volume or percent of income) for their water usage (Cook, Fuente, and Whittington 2020; Cook et al. 2020). Pricing may not ensure full cost recovery; even for high-income private utilities, the profit margin for water supply is typically small. Local governments may have access to tax revenue not associated specifically with water services, low-interest loans, or grants. Figure 2 captures a wider variety of potential pathways for water supply funding, some of which are less common in practice.

VARIED CHARACTERISTICS OF RURAL WATER SUPPLY FUNDING SCHEMES

PUBLIC SOURCES		PRIVATE SOURCES
<ul style="list-style-type: none"> • Development banks • National, state, or local government • Bilateral or multilateral aid • Sovereign Wealth Funds • Pension Funds 		<ul style="list-style-type: none"> • Individual investors • Investment groups • Banks • Socially responsible investment funds • Pension Funds
MECHANISM		
<ul style="list-style-type: none"> • Tax revenue • Development assistance 	<ul style="list-style-type: none"> • Guarantees • Grants • Loans 	<ul style="list-style-type: none"> • Bonds • Matching

Figure 2. Varied potential characteristics of rural water supply funding schemes (Source:Vanessa Guenther,Aquaya Institute)

- **Development banks** – also called development finance institutions, are often backed by governments or nonprofit organizations.They operate from the community to international level to provide higher risk loans, equity, and guarantees for economic development programs otherwise unable to access commercial lending.
- **Bilateral aid** – development assistance transfers from a higher-income country government to a lower-income country government.
- **Multilateral aid** – development assistance transfers from a coalition of higher-income country governments to a lower-income country government.
- **Sovereign wealth funds** – also called sovereign investment funds or social wealth funds, are government-run investment funds used to gain interest on surplus reserves.
- **Pension funds** – pooled monetary contributions from an organized group of workers that provides for members’ retirement benefits. Funds are usually invested to gain interest over time.
- **Socially responsible investment funds** – pool of investment opportunities for private individuals that promote social good while generating interest returns.
- **Guarantees** – contractual agreement by a third party to repay debt if the guaranteed party cannot pay.
- **Grants** – funding offered to support social good, without an expectation of repayment.
- **Loans** – an upfront financial transfer repayable to the lending institution with interest. Loans may be commercial (offered at market rates) or concessional (with more favorable interest rates or repayment agreements).
- **Bonds** – a program in which many individual investors can lend money to a government entity for a defined period of time to raise needed funds and earn interest.
- **Matching** – an approach used to motivate fundraising and multiply its impact.

When setting water prices, service providers often use different types of fee blocks or subsidies to transfer some revenue from higher-income to lower-income consumers. In some cases, providers with other income streams (e.g., tax revenue, development aid) charge fees less than the true cost of water, although such subsidies have more frequently benefited wealthy consumers (Andres et al. 2019). Pro-poor and pro-women water subsidies that help to reduce disease externalities will likely continue to be necessary to meet global development goals (Ahuja, Kremer, and Zwane 2010; Nagpal, Malik, and Eldridge 2018). Water connection and use subsidies are more viable where they supplement user payments that already support some or most water supply operation and maintenance costs.

WHY DOES RURAL WATER SUPPLY FACE FINANCIAL CHALLENGES?

Safe water access disparities among countries, and within countries between urban and rural areas, can carry a heavy financial toll (e.g., due to poor health) and reinforce poverty (Goksu et al. 2017). Most of the world's water-insecure rural population lives in Africa and Asia, although underserved populations (often pockets of minority indigenous and ethnic groups) remain dispersed across other continents as well (Hope et al. 2020). Institutional knowledge and local governance tends to be weaker in rural areas of low- and middle-income countries (Savoy 2022). In general, water has often been undervalued, such that the local and global benefits of water services to economic categories such as agriculture, healthcare, property values, and individual income and tax revenue remain undocumented (OECD 2018). Several “bottlenecks” limit the enabling environment for WASH financing, including mismatches between finance supply and demand, poor service provision, operational inefficiency, and a lack of anti-corruption measures (Pories, Fonseca, and Delmon 2019).

Infrastructure improvements usually require a high startup investment, followed by a lengthy period during which operations and maintenance must be carried out effectively and efficiently to recover costs. Public sector inefficiencies, as well as a lack of analytical tools to monetize benefits and carefully project the costs of water supply development, can deter investors. In comparison with urban areas, rural infrastructure generally costs less, but lacks economies of scale. Rural water suppliers serve more dispersed populations; thus, financial contributions from a smaller pool of users, all of whom may be economically disadvantaged, rarely suffices to recover full costs. In addition, water demand in low-income rural areas fluctuates seasonally, as residents often alternate among using several water sources (Hope et al. 2020).

Further, growing consensus suggests that financing beyond capital investment subsidies is necessary to support reliable, safe, and affordable water services (Ahuja, Kremer, and Zwane 2010; Nagpal, Malik, and Eldridge 2018; Nilsson et al. 2021). Water systems around the world struggle to cover ongoing expenses due in part to limited user payments, even those made on behalf of government agencies (McNicholl et al. 2019; World Health Organization 2020; 2019; Water Integrity Network 2020). One study of four medium-sized urban water utilities spanning low, middle, and high-income communities found gaps between revenue and water delivery costs ranging from \$1 to \$17 per customer per year² (Libey, Adank, and Thomas 2020). Even where revenues cover ongoing expenses, they often neglect long-term investment to improve water safety and resilience. There is often pressure to keep water fees low as a public right.

² All values are given in U.S. Dollars.

Given the difficulties of sustainably centralizing water supply over large swaths of land, many rural residents opt to finance, install, and operate their own water supply system (self-supply), if they can afford it. Achieving water access for everyone will likely require a blend of public and private service options, including self-supply (USAID 2020). However, private systems typically lack standing oversight, consumer education programs, and monitoring mechanisms, making them more susceptible to water quality and health risks (Craun et al. 2010).

HOW HAS ATTENTION TO WATER SUPPLY FINANCING SHIFTED OVER TIME?

The 1950s and 1960s saw increases in multilateral and bilateral government development aid targeting to address the high morbidity and mortality associated with inadequate access to safe water and sanitation (Figure 3). At the first 1972 United Nations (UN) Conference on the Environment, participants issued a global call (the Stockholm Declaration and Action Plan for the Human Environment) for water supply, sewerage, and waste disposal systems adapted for local conditions. The 1980s ushered in increased global focus on water supply issues with the “International Drinking Water Supply and Sanitation Decade.”

By 1990, the UN Convention on the Rights of the Child had materialized from the Declaration and Plan of Action established during the World Summit for Children (Figure 3). It called for universal access to safe drinking water and systems for sanitary excreta disposal. The international community first recognized a specific human right to water in 2002 through the UN Committee on Economic, Social and Cultural rights. Human rights to safe, clean, accessible, and affordable water and sanitation were established in 2010 through UN General Assembly and UN Human Rights Council resolutions. Private investment in water and sanitation development (e.g., through nongovernmental organizations) also began to swell during the 1990s. The Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP) formed in 1990 when the World Health Organization (WHO) and UN Children’s Fund (UNICEF) resolved to coordinate monitoring of global water and sanitation conditions.

The UN Millennium Development Goals came out in 2001, after ratification of the Millennium Declaration in 2000, aiming to greatly increase water and sanitation access. The early 2000s saw increasing international coordination among countries specifically on directions for financing water infrastructure (Figure 3). Initiatives to improve evidence and accountability for water financing decisions came about in the late 2000s. In the 2010s, tools to better track finance data emerged. Following the conclusion of the Millennium Development Goals, the Sustainable Development Goals were activated in 2015 under the 2030 Agenda for Sustainable Development unanimously adopted by UN Member States. Goal 6 aims to “ensure availability and sustainable management of water and sanitation for all” by 2030.



KEY EVENTS

IN FINANCING RURAL WATER SUPPLY DEVELOPMENT



Figure 3. Timeline of key events in financing rural water supply development (Source: Aquaya Institute; Development Initiatives 2016; Winpenny 2003; 2011; Goksu et al. 2017; WHO 2017b; OECD 2013; UN 2014; World Health Organization 2019)

WHAT IS THE STATUS OF RURAL WATER FUNDING?

Sustainable Development Goal 6 is pushing the global water sector to achieve universal, equitable, sustained safe water services (United Nations 2018). Achieving safe water for all by 2030 remains extremely ambitious. A “safe” drinking water supply should not pose any significant health risk over a lifetime of consumption, due to either quantity or quality (WHO 2017a). “Safely managed” means the water supply is always accessible at a person’s residence, available when needed, and free from contamination (WHO UNICEF Joint Monitoring Programme (JMP) 2017). Globally, more than two billion people still lack access to safely managed water services (WHO/UNICEF JMP 2020). As of 2020, rural dwellers represented the majority of people lacking even basic water services (i.e., water from a protected source requiring no more than 30 minutes to collect; WHO UNICEF Joint Monitoring Programme [JMP] 2021).

While governments have confirmed commitments to universal water access in national development plans and made noticeable strides towards its realization, national- and global-level progress varies, with the remaining gaps predominately in rural areas of low-income countries (WHO/UNICEF JMP 2020). Despite a strong economic case for investment in water infrastructure, with estimates of benefit:cost ratios as high as 7:1, financing flows have not kept pace with demand (OECD 2018). The additional investments in rural water supply required to achieve Sustainable Development Goal 6 by 2030 are estimated at \$13.8 billion per year (Hutton and Varughese 2016), corresponding to up to a four-fold increase over current spending (Leigland, Trémolet, and Ikeda 2016).

Traditional sources of water supply funding (tariff revenues and direct investments paid by households, subsidies via domestic taxpayers, and development assistance from bilateral and multilateral donors as well as philanthropic actors) will likely be insufficient to meet the projected costs in the near term. These substantial financing shortfalls demand innovative approaches to “unlock” additional finances from the international to community levels to realize global and national targets for safe drinking water access (World Health Organization 2019; Watts, Walton, and Knox 2021). Critiques of donor financing initiatives suggest they focused too much on the supply of funds rather than stimulating viable demand (Kolker 2022). The situation calls for improvements to technical and financial efficiency among borrowers (local utilities, governments, or other water providers) as well as transparency for public accountability.

WHAT DOES THIS REPORT COVER?

Reflecting the aims of the REAL-Water program, the report prioritized compelling concepts that could feasibly expand safe water services in rural areas of low- and middle-income countries and accelerate progress toward global goals. This compendium highlights several novel water supply financing and funding concepts for brief comparison and reference by research planners, donors, and managers involved in rural water development for low- and middle-income countries. It focuses on addressing basic needs as specified in global WASH agendas, particularly water access, notwithstanding the importance of incremental service improvements.

The compilation is not comprehensive, and we did not examine financial innovations limited primarily to high-income or urban settings. We were unable to capture in-depth information on microfinance programs (Box 1), socially responsible investment funds (also called ESG funds), or carbon neutrality funds (Box 2). Water cooperatives were omitted due to their prevalence mainly in high-income rural settings and lack of distinction from community-based management in low-income rural settings (Ruiz-Mier and van Ginneken 2006; World Bank 2008; Sorokovsky and Olschewski 2012; Deller et al. 2009; Arvonen et al. 2017; Pareja Pineda, Fuentes, and Arriagada 2022).

We defined “rural” as locations outside of urban centers, including small (often agrarian) villages and low-density communities but excluding mid-sized or large towns. “Innovation” broadly refers to a novel concept, method, or approach, whether in theory or application. Featured innovations offer advantages over conventional approaches as well as potential for implementation at larger scales. The report focuses on financial instruments that build upon straightforward model of consumer payment for water services, which suffers from affordability and sustainability shortcomings. It recognizes that adoption of innovative financial strategies strongly depends upon acceptability within one’s local context, local and global economic forces, and effective water system management. General commentary on overcoming barriers to financial innovation is included, along with service provider and literature references for more information.

Seven modules follow, arranged roughly in order of geographical scale, from the community to global level:



Each module discusses the background (need for the innovation), solutions (offerings, pros and cons), and examples in practice. We also comment on the stage of development, marketing considerations, and scale of global dissemination, categorized as:

 <p>Conceptual</p>	 <p>Under pilot evaluation</p>
 <p>Limited application</p>	 <p>Widely implemented</p>

BOX 1. MICROFINANCE OFFERS SMALL PERSONAL LOANS FOR WATER SUPPLY UPGRADES.

Water.org’s WaterCredit and WaterEquity programs support direct consumer lending, primarily with respect to onsite sanitation but also for purchasing piped household water connections that achieve a “basic” level of service. These programs direct technical assistance to microfinance institutions (OECD 2019b; IRC n.d.), which have loaned approximately \$3.7 billion via 10 million small household loans over the course of 15 years, with nearly complete repayment (Water.org 2022). Few evaluations of other program outcomes such as water safety, health, and socioeconomic status are available to date. When conducting evaluations, it may be difficult to verify household-level product installation and use (Davies and Tinsley 2013). A 2019 WaterCredit evaluation demonstrated beneficial reductions in water collection times among women and girls (UTS 2019), which has been linked to greater economic opportunity (Winter, Darmstadt, and Davis 2021). It also showed mixed satisfaction with the low loan amounts and high interest rates. Water connection demand was higher in urban areas, partly due to piped network accessibility.

WaterEquity, a water.org asset management spinoff from 2016, raises equity capital from a suite of sources (institutional investors, foundations, impact investors and donor-advised funds) alongside debt capital from the United States International Development Finance Corporation (WaterEquity 2022). As of 2021, WaterEquity deployed more than \$140 million across nine countries in Africa, Latin America, and Asia, with about 22% of microloans used toward water services (WaterEquity 2021). As with most microfinance examples, the small consumer loans have high interest rates, averaging about 28% for one servicer in rural India (Edens et al. 2021). World Vision has begun expanding a similar microloan program for household water connection and storage equipment into five countries in Africa in partnership with the microfinance institute, VisionFund (McGarvey 2022).

BOX 2. CLIMATE FINANCE HAS PARALLELS WITH RURAL WATER SUPPLY DEVELOPMENT.

As human-induced global climate change progresses, many individuals, corporations, and governments are seeking ways to reduce greenhouse gas emissions. Low- and middle-income countries where water is often boiled before consumption (e.g., Cambodia, Laos, Indonesia, Vietnam, Uganda, Guatemala) pose an opportunity to reduce climate impacts while continuing household-level water treatment (Summers et al. 2015; Thomas 2012). Such schemes replace the demand for burning wood or other carbon-based fuels, which results in deforestation and carbon emissions, with alternative, low-carbon water disinfection methods such as chlorine dispensers or water filters (South Pole Group 2016; van der Kerk 2016). Once the project is verified by an international standards group, revenue from selling carbon credits to climate impact investors allow communities to continue purchasing water treatment supplies. These approaches have been tested in several countries, but require rigorous auditing and may not directly reduce emissions or achieve safer water in practice (Summers et al. 2015). Accurate monitoring may require extended observation of user compliance. Other risks include the fluctuating market value of carbon credits and the need to hire brokers to attract investors (van der Kerk 2016). Future iterations may be conceptualized as reparations (Thomas, Ntzinda, and Kathuni 2023).

Larger urban and rural water service providers that use energy to obtain, treat, and distribute water may benefit from newer climate financing mechanisms: pooled climate funds, “resilience” bonds that bolster investment in hardy infrastructure, results-based financing for non-revenue water reduction, small loans from revolving funds, climate change microinsurance policies, or tax benefits (Cooley et al. 2020). For instance, the international “Adaptation Fund” finances climate adaptation in low- and middle-income countries, under the United Nations Framework Convention on Climate Change. It draws funding from governments, private donors, and emission reduction credits. One example program in the Dominican Republic, a vulnerable small island developing state, uses the climate financing to address resilience to floods and droughts as well as water security (Adaptation Fund 2021). Newer funds, including the Green Climate Fund and the Financing Locally Led Climate Action Program, support climate adaptation efforts in Kenya, with an eye toward water resources management and water supply infrastructure (Arnold and Soikan 2021; Green Climate Fund 2021b). Similarly, an example of climate funding deployed in Grenada aims to build water storage capacities, create new rainwater harvesting systems, improve remote monitoring, and introduce renewable energy for water pumping and treatment (Green Climate Fund 2021a).

INNOVATION I: VILLAGE SAVINGS FOR WATER

BACKGROUND

Community-based management dominates the rural water supply landscape in low-income settings. Scrutiny of this arrangement has increased since the 2000s, but expansion of alternative management models remains slow (Lockwood et al. 2016; Lockwood 2019). Unsupported volunteer water management committees may ineffectively collect and manage water user fees (Harvey and Reed 2007; Chowns 2015; van den Broek and Brown 2015). Poor transparency and repeated misuse of water point funds erodes trust in and authority of these non-professional, low-capacity committees. Water users then logically hesitate to make regular payments for water point use or stop paying entirely. Without centralized government support or a functional revenue collection mechanism, most rural communities are left unable to pay for major water point repairs and may face extended periods without service (Foster 2013; Walters and Javernick-Will 2015; Hope and Ballon 2019).

Change is needed to maintain water infrastructure and service delivery in community-managed water systems. Revenue collection enhancement strategies seek to address the underlying behavioral and technological drivers of financial management shortcomings for rural water systems. In addition to sustainable fee collection, communities must be able to access skilled and efficient water system maintenance services that offer a good return on their financial contributions (Foster 2013; Setty et al. 2022). Concepts such as digital financial services (Innovation 2) and sensor technologies (see companion report, Technological Innovations for Rural Water Supply in Low-Resource Settings) have shown promise for increasing payment compliance and reducing community management responsibilities following a breakdown (Hope et al. 2011; Nagel et al. 2015; Wilson, Coyle, and Thomas 2017; Waldron et al. 2019); however, they have yet to reach many communities (Coulibaly 2021).

SOLUTIONS

One low-barrier approach to improve funding for water system maintenance shifts financial management duties from volunteer water committees to new or existing community-based savings and credit associations. These self-selected, self-governed groups offer rural residents informal yet structured financial services with several built-in accountability mechanisms. Groups made up of 5–40 members usually operate on a 12-month cycle (VSL Associates 2022; Orr et al. 2019; Allen and Panetta 2010; van Swinderen et al. 2020). At the beginning

FINANCIAL SCALE CATEGORY



Community

STATUS



Limited application

of each cycle, the group develops a constitution, defining savings and borrowing terms along with group bylaws (Figure 4). At weekly or monthly meetings, each member deposits the agreed amount of money into a common fund. Members can then take small, low-interest loans from this internally-generated capital. At the end of the cycle, each member receives their savings plus a portion of the overall interest earned from loans. Many savings groups offer a small mutual insurance scheme as well, using funds to provide allowances or no-interest loans in the case of unexpected member hardships (e.g., family illness or death).

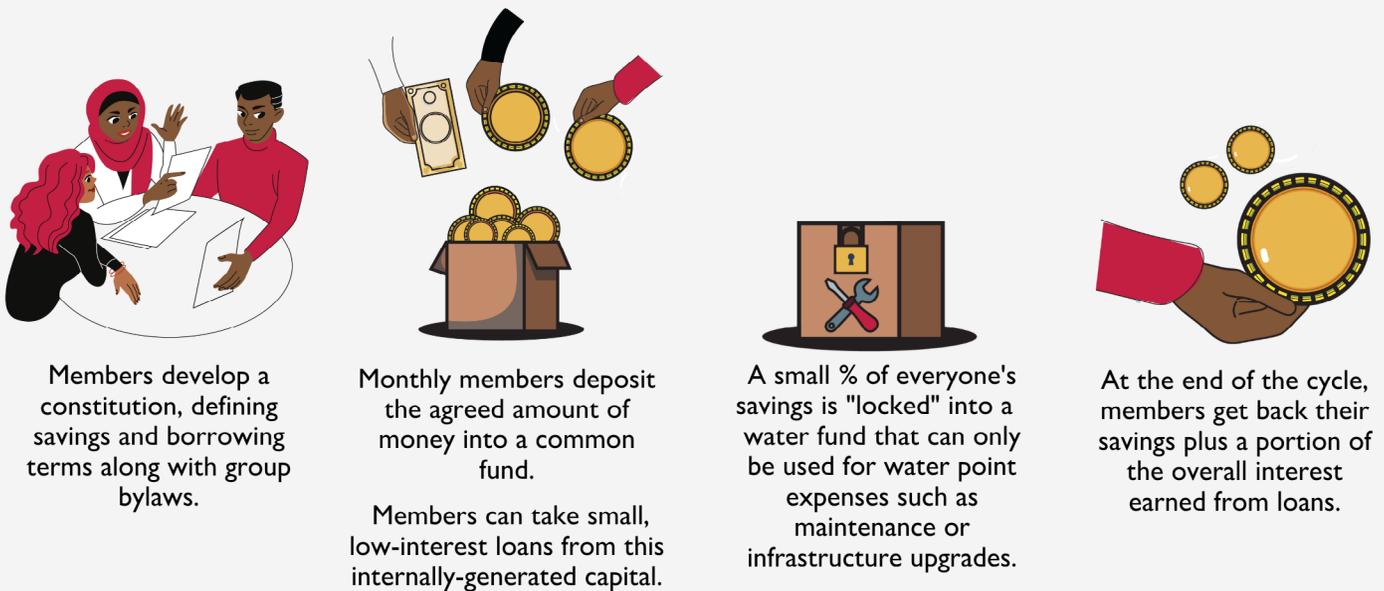


Figure 4. Typical community savings group approach (Source:Vanessa Guenther,The Aquaya Institute)

Informal savings groups have been a fixture in rural communities for decades, with proliferation led by nongovernmental organizations, notably CARE International, Catholic Relief Services, Plan International, Aga Khan Foundation, Oxfam, and Freedom from Hunger. Their varied names include: “village savings and loan associations (VSLAs),” “self-help groups,” “rotating savings and credit associations,” “accumulating savings and credit associations,” “community-based microfinance,” and “savings and internal lending.” Many governments now recognize savings groups

in their financial inclusion policies and guidelines (Jarden and Rahamatali 2018). The familiarity and formal recognition of savings groups fosters community and government support, making them an attractive avenue for delivering other development initiatives. Over the past ten years, interest has grown in linking agricultural, gender, health, and personal finance development agendas to community savings groups (Biscaye et al. 2014; Gash 2017; Gugerty, Biscaye, and Anderson 2019; Orr et al. 2019). Leveraging savings groups for water and sanitation programming has likewise garnered greater attention (Aboma and Osterwalder 2020; Murakwani et al. 2021; Asimwe et al. 2021; Marshall, Guenther, and Delaire 2021).

While savings groups may provide a more efficient, transparent, and individually beneficial vehicle for establishing and handling water fund collections (relative to water management committees), affordable contributions in low-income settings often still fall short of covering the full costs of water system maintenance and could be lost to low-quality service providers. Thus, several organizations have begun consolidating professional water system mechanics under umbrella suppliers that offer subsidized high-quality maintenance and rapid repairs of community water points in exchange for a subscription fee. Subsidized business models such as Everflow, Whave, Fundifix, and UDUMA pool financial risks over a large service area and guarantee water point functionality for participating communities (SustainableWASH Systems 2020; REACH 2017; UDUMA 2017; Smith 2021). Communities in the service areas typically sign up for an annual maintenance contract. These services can improve regional water point monitoring and coordination, while preventing and pooling the risks of costly repairs across systems.

In addition to protecting water system maintenance funds, savings groups could support new household infrastructure. For example, a household or small cluster of households could acquire a loan through the savings group to finance a water system installation or upgrade (Mengueze et al. 2014; Mwale and Marsh 2016). Further, coordinating community savings groups into networks opens the potential to connect them with external capital providers (e.g., microfinance institutions or revolving funds); these might support community-level water supply upgrades (Trémolet 2012) or improve collective bargaining power to request improved services (Sinha et al. 2006; Olofsgård, Joshi, and Desai 2016).



PROS

- Savings group transactions only occur at public meetings, promoting **transparency**. Accounting books managed by an elected committee are reviewed with the full group during each meeting.
- Savings groups tend to have robust **accountability** mechanisms. For example, money might be stored in a box with three locks, and each key kept by a different person. Converting to digital financial services (see Innovation 2) may also be possible (UNSGSA 2022).
- Because savings group offer members multiple economic and non-monetary psychosocial benefits, they engender **trust and willingness to pay**.
- Savings groups build **social capital** among members to promote collective action capabilities.
- After a training period, most savings groups are able to effectively self-manage for several years with **limited external support**, assuming the approach fits within existing sociocultural norms (Wheaton 2018; Allen and Panetta 2010; van Swinderen et al. 2020).
- Water point upkeep **costs may stabilize or decrease** over time if preventive maintenance is professionally managed, leading to fewer unexpected expenses and service disruptions.
- Savings groups may offer a platform for piloting new water treatment technologies or interventions (Freeman et al. 2012).
- Among other purposes, **small loans** from savings groups could be used to upgrade a member household's water infrastructure.

CONS

- Savings groups rely on **social trust** and cannot be formed or sustained in communities with extensive inter-family conflicts or feuds (Prottas, Dioguardi, and Aguti 2018).
- **External support costs** for savings group startup could exceed \$1,000 per system, with a longer time frame needed to observe returns in the form of a sustained water fund (The Aquaya Institute, data pending publication); however, the return on investment considering all-purpose savings can reach up to 20:1 (Krause 2022).
- Savings groups are **susceptible to disintegration** (i.e., disbanding), especially if multiple members default on their loans.
- Reliable, skilled **maintenance service providers** (e.g., from nongovernmental rural service consolidation initiatives) should be connected with savings groups to ensure water funds result in system functionality and continuity. These services may require ongoing subsidization.
- Preventive maintenance payments represent a **novel concept** in many low-income rural areas, and improved water point functionality could inadvertently reduce willingness-to-pay (Brown and van den Broek 2020; Setty et al. 2022; Smith, Atwii Ongom, and Davis 2023).
- Savings group **members may object** to use of funds to benefit non-members who use the water supply. The most poor and vulnerable community members often do not join savings groups, which might negatively impact their water access.

- Savings groups may need to **weigh priorities** if faced with supporting different types of community development interventions.

EXAMPLES

Several implementation examples in Sub-Saharan Africa have leveraged savings groups to support water point management, or vice-versa (Figure 5). In the Lira district of Northern Uganda, existing water user committees began offering small loans for personal needs, which reinforced their record-keeping accountability as well as the community's commitment to paying monthly for water services (Nabunnya et al. 2012). Challenges included some lingering refusal to pay for water and the informal process and money handling approach (by the local volunteer treasurer). In the Kamwenge district of southwestern Uganda, Water for People trained communities on financial planning for water point breakdowns, with savings groups as one of the strategy options (Muhangi 2018). Additional Ugandan examples come from Link to Progress (Piracel 2021), The Aquaya Institute (Marshall, Guenther, and Delaire 2021), WE Consult and Charity Water, Lifewater International, and Amref (Teo 2016). SEND has supported savings groups in Sierra Leone (SEND 2020), while the USAID West Africa Water, Sanitation, and Hygiene Program (USAID ND) and the nongovernmental organization WaSaDev have supported savings groups in Ghana.

In Malawian “borehole banking,” a central account is established at a water point and contributions are made through monthly water user fees. Then, community members who contribute can access loans, to be paid back with interest to the water point account (Mbewe 2018). A pilot of 175 water points with “borehole banks” achieved an average savings of approximately \$80 for operation and maintenance, about ten times higher than the average savings reported for water points without borehole banks. The rate of functionality increased from 64% to 94% between 2015 and 2017.



Figure 5. Village Savings and Loan Association members in the Kabarole district, Uganda, holding up their passbooks (Source: Katherine Marshall, The Aquaya Institute)

In another program from Uganda, The Water Trust worked with VSLAs to set aside an agreed-upon fraction of members' payments is earmarked as a "water point reserve fund," which can only be used for handpump maintenance. Monitoring results have been encouraging: in the 2017 pilot, 32 water points with VSLA-based water funds had collected an annual average fund about four times greater than 28 communities relying on coached water user committees or a maintenance contract approach alone (Prottas, Dioguardi, and Aguti 2018). By 2020, The Water Trust invested training resources to extend the approach to more than 200 communities, with annual reserve funds continuing to meet or exceed target amounts (The Water Trust 2020). The approach has expanded to cover more than 700 water points, documenting higher measures of water point functionality and active water point management for water points with an associated VSLA (The Water Trust 2022).

The Aquaya Institute (pending publication) piloted the VSLA approach among 10 communities in Kabarole District, Uganda. VSLA members whose handpumps were first rehabilitated contributed between half and greater than 100% of target amounts for water point upkeep in the first year, compared to having no reserve funds for water point maintenance prior to the intervention. Primary challenges to VSLA sustainability appeared to be (a) perceived unfairness from some water point users not joining and (b) the risk of water funds being loaned out if they remained unspent for too long.

The subscription maintenance service enterprises mentioned earlier have not worked exclusively in concert with savings groups as a mode of fee collection, but may consider this approach in future programming iterations. Finally, Tearfund and others have observed limited use of self-help groups in concert with water treatment or distribution installations in Ethiopia and elsewhere (Lawson-McDowall et al. 2016).

STAGE OF DEVELOPMENT

The methods and benefits of savings groups are well established (Brody et al. 2015; Gash 2017; Gugerty, Biscaye, and Anderson 2019; Duvendack and Mader 2019). Professional training guidance to set up VSLAs comes from Catholic Relief Services, Oxfam, VSL Associates, and World Vision (VSL Associates 2022). Although the concept of using savings groups to mobilize and manage water point funds has existed for several years (Agbenorheri and Fonseca 2005), this approach is not yet common and remains in the early stages of evaluation research (e.g., by The Water Trust and The Aquaya Institute). Despite compelling examples, its application to serve rural water supply services is globally limited. The knowledge base comes almost exclusively from implementation experience, with fewer examples of rigorous evaluation at scale. Improved documentation would improve the sector's understanding of how to most effectively leverage community savings groups to improve rural water services.

STATUS

Limited application

MARKETABILITY

Numerous savings group examples, albeit not necessarily integrated with water services, can be found in Africa, the Middle East, Asia, and Latin America; global membership was estimated at more than 20 million people in nearly 900,000 formal community associations across

77 countries, concentrated in sub-Saharan Africa (Wheaton 2018; VSL Associates 2022). In addition, “self-help groups” in India were estimated at 8.7 million, covering 200 million members as of 2018 (National Bank for Agriculture and Rural Development (NABARD) 2018).

Savings groups that support water point management may hold the most interest for government service providers and nongovernmental organizations that are able to offer subsidies. Rural service providers challenged by inconsistent user payments should consider experimenting with community savings groups. The approach may be more effective where pay-as-you-fetch systems are underperforming (Marshall, Guenther, and Delaire 2021), pointing to communities served by public handpumps as the target market. Danert (2022) estimates that approximately 20% (ranging from 1%–60%, by country) of sub-Saharan Africa’s population relies on handpumps. Additional opportunities arise in communities with gravity flow schemes and mechanized boreholes that have regularly struggled to collect revenue.

SCALE OF DISSEMINATION

Examples of community savings groups used to support water system management, mainly from African countries, are discussed above.

INNOVATION 2: DIGITAL FINANCIAL SERVICES

BACKGROUND

The digital revolution has altered ways of doing business in many sectors. One strategy to address the gap in rural water funding is to increase the financial sustainability of water systems through improved water revenue collection and management (Waldron and Sotiriou 2017). Service fee collection in low-income countries relies mainly on cash, which can be labor-intensive, difficult to track, susceptible to miscalculation, and may risk theft or loss (Sharma 2019). Automated digital recording of time-stamped water usage and payment data would aid planning, projecting, and improving water service delivery (Waldron et al. 2019). Increasingly, accurate digital records are required to qualify for innovative performance-based finance mechanisms and repayment schemes from governments (see Innovation 4). Good record-keeping aids water service providers in tracking performance changes over time, as well as supporting financial sustainability, water conservation, and climate adaptation. Digital systems must adapt to and work within the constraints of user needs and behaviors, with appropriate governance and institutional controls, to support improvements (Waldron et al. 2019).

SOLUTIONS

Innovations in digital financial services could help to address revenue collection problems, in conjunction with automated metering technology at community or household water distribution points. “Digital financial services” encompasses two concepts: financial services (e.g., payments, savings, credit, insurance, user help) and the technologies that deliver them to end users (Waldron et al. 2019). Services such as online savings or credit accounts mainly benefit adults who work outside the home and have bank accounts (Coulibaly 2021). Digital technologies accessible to cash users may include mobile money (electronic wallets using a mobile phone), water sale kiosks or “ATMs,” and prepaid token technologies (see companion report: Technological Innovations for Rural Water Supply in Low-Resource Settings).

Customers can use digital mechanisms to purchase water at their convenience, thus reducing wait time and operational downtime when a live vendor or caretaker is unavailable (Waldron et al. 2019). With prepaid digital services, water fee collection efficiency increases to near 100% (with the exception of targeted subsidies or discounts). “Post-paid” digital financial services (collecting fees later for prior water use) allow service providers to automatically track what is owed and

FINANCIAL SCALE CATEGORY



STATUS



initiate billing. Digitization may enable better payment compliance, as those with seasonal or inconsistent income are able to deposit a sum of money and draw on it over time (Sharma 2019). Alternatively, those with regular income and difficulty saving can automate small withdrawals without extra effort. Digital financial services likewise make it easier for customers to request subsidies, and for implementers to activate them (Waldron and Sotiriou 2017). Finally, data from digitized transactions increases its accessibility for water operation managers and may help to justify external funding.



PROS

- Prepaid meters and automatic water dispensers such as water ATMs are **accessible around the clock**.
- Fee **collection efficiency increases drastically** with digital financial services, especially for prepaid water services. Operators spend less time locating customers to collect fees (Waldron, Hwang, and Yeboah 2018) and consumers do not accumulate debt.
- Digital data tracking reduces the burden on station operators and field service officers and ensures **data accuracy and accessibility** for analysis or decision-making.
- Digital financial services may **simplify subsidy delivery** to address consumer needs.
- Customers with seasonal income may be able to better **automate their financial planning** using digital financial services.
- Easier billing and payment methods can also provide opportunities for customers to **build credit histories** (Ikeda and Liffiton 2019).



CONS

- **Poor telecommunications connectivity** could prevent or interfere with digital financial technologies, especially in remote areas (Sharma 2019).
- Digital transactions sometimes introduce **new fees** that have to be covered by the service provider or customer (Waldron et al. 2019).
- Implementers take on significant **risk in purchasing digital service hardware** (e.g., water ATMs) if unforeseen circumstances lead to a lack of demand. New equipment can be vandalized or malfunction, requiring ongoing monitoring and maintenance efforts (Heymans, Eales, and Franceys 2014). Supply chains for replacement parts may pose another challenge.
- Often, customers and station operators **require local training and expertise** to master digital transactions and troubleshooting (Figure 6).
- Some rural community customers **distrust technology** and believe water services should cost less or be free. Implementers need to have a team in place that can share proactive messaging and respond to customer concerns (Heymans, Eales, and Franceys 2014).

- Hardware and software **costs will likely decrease** over time as global use of digital financial services expands.

- For services that operate with mobile money, customers risk **unregulated** “shadow banking” (groups not subject to regulatory oversight) and account balances are likely uninsured. Regulated vendors must keep up to date with changes in laws applicable to digital transactions.
- In cases where digital solutions replace cash transactions, it can lead to **income loss for traditional vendors**, which may cause disputes within the community.



Figure 5. Training a customer in Ruiru, Kenya on how to use his phone for making water payments (Source: Joyce Kisiangani, The Aquaya Institute)

EXAMPLES

Technology provider Grundfos partnered with the nongovernmental organization World Vision and Safaricom, the leading telecommunications provider in Kenya, to install 32 self-service water kiosks (called LifeLink systems) in locations that lacked water infrastructure, serving both homes and businesses (Waldron et al. 2019). Initial uptake was high and interviews documented user benefits from reduced favoritism in water distribution as well as being able to track and review spending. Collecting mobile payments cost less than collecting cash payments, a savings that could be reinvested to upgrade services or passed onto consumers (Sharma 2019). The World Bank and others have likewise been working to scale affordable water installations in Tanzania using prepaid Grundfos card kiosks combined with solar pumping, which vastly reduces water transportation time and stabilizes high prices offered by private sellers (World Bank 2017). Recognized downsides of this and other digital payment examples have included questions of who requires data access, remote monitoring needs, labor cuts, reduced customer service capabilities, and difficulty paying among the ultra-poor (Waldron et al. 2019).

The nonprofit organization Safe Water Network uses Hangzhou LAISON Technology digital household prepaid meters in their piped connection program in Ghana. Customers receive a device to input a token purchased through mobile money. New users joined quickly following customer workshops to explain the payment system, and the enhanced cost recovery shifted the operation from a net loss to a net surplus (Waldron et al. 2019). Ensuring proper use will likely require sustained engagement. Safe Water Network has continued expanding the household connection metering program to serve several thousand households in small rural towns in Ghana's Ashanti Region.

STAGE OF DEVELOPMENT

STATUS

Limited application

MARKETABILITY

Digital financial services such as prepaid meters and pay-as-you-go water ATM cards are clearly viable as a solution to increase service delivery efficiency, convenience, and cost recovery. Still, the startup and ongoing maintenance costs may limit the range of rural water supply contexts where digital investments make sense. Innovative solutions might apply in the short term to systems where fee collection gains or labor savings outweigh new expenses, or where the expense is justified by the social

impact and a source of subsidy funding is readily available. Village savings and loan associations (VSLAs) that support water management (see Innovation 1) offer an opportunity to introduce digital financial services, such as group mobile money accounts and water fund management applications (UNSGSA 2022; Petrulla 2020).

The market lacks full-service digital financial solutions that address all needs of rural water suppliers; thus, service providers may seek out multiple technology suppliers with different operating platforms, leaving data to be stored in different databases and integrated manually (Waldron et al. 2019). To increase market viability among small-scale water enterprises, digital financial service innovations should be built with open-source application programming interface capability. Digital financial services do not represent a fix-all solution. Their successful application requires substantial training and effective governance to transition service providers and communities to new processes that increase collection efficiency with a minimal impact on customers' water use (Heymans, Eales, and Franceys 2014).

SCALE OF DISSEMINATION

Digital financial service innovations have made inroads globally in urban areas and are rapidly expanding to serve rural residents in Africa, Asia, and Latin America. As use expands, social inclusion efforts may be needed to ensure the services benefit vulnerable populations (Coulibaly 2021).

INNOVATION 3: WATER QUALITY ASSURANCE FUNDS

BACKGROUND

The risk involved in recovering invested funds often forestalls rural water service provision projects. Guarantees are one widely used mechanism (e.g., for personal loans or leases) wherein a third-party individual or organization (the guarantor) agrees contractually to fulfil the financial or other obligations of the guaranteed party, if they “default” for any reason and cannot pay on time (PPIAF 2009; Sijbesma, Pezon, and Verhagen 2011; Lu, Chao, and Sheppard 2019). “Escrow” or reserve accounts serve a similar role, ensuring accessible up-front savings when needed, for example to pay for anticipated bills or predictable equipment failures (Fonseca et al. 2013). At a large scale, public and private development finance institutions have long offered third-party backing as a credit enhancement instrument to facilitate water infrastructure projects in otherwise neglected and risky markets (Winpenny 2003; Pories, Fonseca, and Delmon 2019; Castro and Delmon 2018; World Bank Group 2016a). This approach leverages public funding (see Innovation 7: blended finance) to overcome issues of creditworthiness, or the level of trust in a utility’s ability to repay debts.

Community-managed rural water supplies are increasingly recognized as unsustainable, in part because communities with small water systems (e.g., handpumps, mechanized boreholes, and small piped systems) often struggle to collect enough money to maintain water infrastructure (Whaley et al. 2019). Under these conditions, they typically must neglect critical aspects of professional water management, such as water quality testing to verify its safety for human consumption. A public or private laboratory may not be willing to provide testing services to rural agricultural communities because of the distance and income irregularity. Introducing a third party guarantor offers a way to spread out the risks of unpaid water testing fees among different stakeholders (Halvorson-Quevedo and Mirabile 2014). The third party can help to facilitate testing arrangements and provide indirect financial support, wherein stand-by funds are only accessed when the local fee-for-service exchange is disrupted.

FINANCIAL SCALE CATEGORY

-  **Local**
-  **Regional**

STATUS

-  **Under pilot evaluation**



SOLUTIONS

“Assurance funds” provide liquid assets (e.g., a savings account) that can quickly be mobilized if a liability arises. Water quality assurance funds are held by a third party (e.g., a nongovernmental organization) to guarantee payment for to the beneficiary (e.g., a centrally located water quality laboratory) if a rural community is unable to pay for water testing services on time (Press-Williams et al. 2021). The laboratory thereby gains revenue by opening another market for their services, while the rural community gains a means to verify their drinking water safety with greater certainty and at a lower startup cost than establishing onsite laboratory capacity. The assurance fund accounting is managed by the third party and can be drawn down slowly, leveraging donor aid, or replenished if the rural community is able to pay back service fees at a later date (Figure 7). Contract enforcement is managed through the local government authorities.

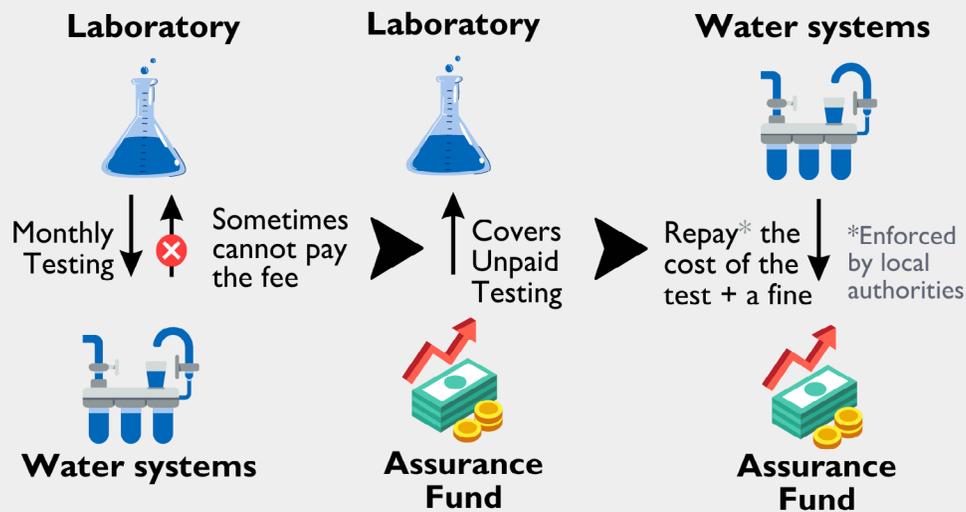


Figure 7. Simplified illustration of a water quality assurance fund mechanism (Source:Vanessa Guenther,The Aquaya Institute)



PROS

- In contrast to one-time interventions, assurance funds provide **long-term support** for local capacity building.
- Improvements in water services may outweigh the time and financial inputs provided by the guarantor, making assurance funds a **cost-efficient** approach for donors.
- The up-front cash balance set aside in a fund **incentivizes** institutions to participate, promoting service delivery among unserved populations associated with greater financial risks.
- **Professionalizing** laboratory testing across an array of rural water suppliers provides more consistent and accurate data.
- Increased data availability may enable better long-term tracking and a quicker response to contamination issues, **protecting consumer health**.



CONS

- Contracts and partnership arrangements take **time and legal expertise** to set up. A single approach may not be replicable in a every regulatory context.
- Implementation of assurance funds requires diligent management to ensure accountability. **Skilled staff must manage** the fund as long as it exists.
- Assurance fund amounts will likely **decline over time** if additional donor support or debtor repayment does not occur.
- Assurance funds require transparent access to user payment records as well as the resources to carry out **due diligence** (World Bank 2022).
- For water quality assurance funds, field and laboratory staff must **adhere to good** protocols to ensure water quality data are accurate and address decision-making needs in a timely manner.
- Communities must buy in to the agreement and have **plans and resources** in place to address water quality contamination, should it occur.

EXAMPLES

With funding support from the Hilton Foundation, The Aquaya Institute (a nonprofit research and consulting organization) developed an assurance fund in 2020 to encourage an existing laboratory to provide water quality monitoring services to small rural water systems in the Asutifi North District of Ghana (Figure 8; Press-Williams et al. 2021). The water systems mobilized community-collected water fees to pay Ghana Water Company Limited's (GWCL's) central laboratory (Figure 9) for monthly services. If they defaulted on payments, then GWCL could file a claim against the assurance fund. This centralized testing approach cost an average of \$67 per test, or approximately 60% of what it would have cost to provide training and testing equipment for each separate water system.

Between March 2020 and January 2021, GWCL testing revealed microbial contamination in more than half of the 134 water samples across nine water systems, raising awareness among water system managers about issues with chlorination procedures (Press-Williams et al. 2021). In most cases, water systems were able to pay GWCL within one month of receiving testing services. Despite payments being delayed for approximately one-third of testing services, GWCL filed only one claim against the assurance fund, instead negotiating directly with the defaulting water systems to allow more time. Extension of the same concept to other districts in Ghana as well as in Kenya, Uganda, and Tanzania is underway with additional funding support from USAID REAL-Water, the Hilton Foundation, and the Helmsley Charitable Trust. Another potential future use of the assurance fund might be to deliver targeted subsidies for specific communities.



Figure 8. Ghana Water Company Limited analyzes bacteria in drinking water samples from small water systems in the nearby rural district of Asutifi North. (Source: Bashiru Yachori, Aquaya Institute)

STAGE OF DEVELOPMENT

STATUS

Pilot evaluation

MARKETABILITY

Situations that call for assurance funds might include (Winpenny 2011):

- Mitigating specific risks that represent a critical sticking point in a water project,
- Improving the terms of financial agreements for multiple parties, and
- Giving businesses, lenders, and investors exposure to previously unfamiliar markets and products.

Requirements for assurance funds to work include community buy-in and often technical assistance. A qualified laboratory must be available in the vicinity for water testing.

SCALE OF DISSEMINATION

Water quality assurance funds have primarily been piloted in Ghana, with expansion underway in Kenya, Tanzania, and Uganda.



Figure 9. A Ghana Water Company Limited technician collects a sample from a water point in Asutifi North, Ghana, as part of the Water Quality Assurance Fund agreement (Source: Bashiru Yachori, Aquaya Institute)

INNOVATION 4: PERFORMANCE-BASED FUNDING

BACKGROUND

Many water supply development projects fail due to well-meaning but poorly-executed investments (McNicholl et al. 2019). Finances may be mismanaged due to limited capacity or oversight, diverted to unforeseen repair needs, or lost outright to corrupt schemes. With no strings attached and weak governance, recipients of development aid such as governments and water service providers may lack incentive to deliver the best outcomes. From the funder’s perspective, poor outcomes reinforce high risk perceptions and may steer resources away from water supply investments. The potential beneficiaries, rural water consumers, suffer the consequences with little opportunity for recourse. As a way to create greater accountability, conditioning financing on verified service delivery has gained increasing attention since the mid-2000s.

SOLUTIONS

Performance-based funding seeks to optimize accountability and transparency while driving efficiency gains on the part of the project implementer (government or water service provider). It is goes by various names, such as: “results-based” funding, financing, or lending; “output- or outcome-based” aid; “program for results;” or “payment by results.” Elements of performance-based funding generally include:

- Targets and/or ceilings for agreed-upon outputs or outcomes;
- An agreed-upon payment amount for each output or outcome (e.g., a new metered household water connection); and
- Some form of independent verification of achievement of the output or outcome prior to payment disbursement.

Payment advances may be necessary, for example if an implementer faces challenges absorbing the costs of service delivery. For example, a government or service provider might pre-finance the capital costs of installing new household water connections, and then recoup part of their investment with a results-based payment from a donor or investor upon verification of installment (Nguyen, Ljung, and Nguyen 2014). Performance-based grants, service contracts, or subsidy programs may also be partially dependent on outcomes, whereby only some payments are contingent upon the achievement of a pre-defined set of results (Howard and White 2020). Investments can be leveraged by coupling

FINANCIAL SCALE CATEGORY



Regional

STATUS



Widely implemented



results-based funding elements with non-results-based elements, such as covering program startup costs, establishing verification protocols, training, or other key outputs.

Specific performance-based financing instruments include development impact bonds (see Innovation 5) and conditional cash transfers. With conditional cash transfers, cash payments are made directly to needy households to stimulate investment in “human capital” (i.e., the knowledge, skills, and health that people invest in and accumulate throughout their lives to become productive members of society) if they meet predetermined conditions (e.g., periodic health checks or school attendance). Payments can also be structured to incentivize entire communities to achieve a public health or water access goal (Nguyen, Ljung, and Nguyen 2014).



PROS

- Performance-based funds **encourage adaptation and innovation** to meet goal-driven outcomes.
- Performance benchmarks **elevate the accountability** of donor and public funding, making rural water financing more sustainable.
- Performance-based conditions can **accelerate efficiency** gains for the service provider by incentivizing incremental improvements.
- Calculating payments entirely from established performance metrics **reduces transaction costs** between the donor and implementer.
- **Sharing data** from performance-based funding programs can better inform the most effective avenues and potential for water service delivery improvements.



CONS

- New funding and financing schemes involve a sizeable **up-front design** effort, as well as ongoing management and monitoring costs.
- Careful performance **verification** is essential to ensure borrowers are actually incentivized to innovate and carry out performance improvements (Howard and White 2020).
- The increased risk and labor of performance-based programs, along with upfront cash needs, may **reduce interest** among service providers or exclude smaller actors.

EXAMPLES

Results-based funding examples originated in the 1960s (World Bank 2007) and continue to spread among a wide range of development finance institutions and geographies (ADB 2019; AFDB 2022). The World Bank established its Global Partnership on Output-based Aid in 2003, renamed in 2019 to the Global Partnership for Results-Based Approaches (World Bank 2022a). As of 2022, the Global Partnership portfolio includes 58 individual projects in 30 countries, with more than 12 million verified beneficiaries as well as an array of technical assistance and knowledge activities (World Bank 2022a). In Kenya, for example, the national government, World Bank, USAID Development Credit Authority, and Dutch development bank KfW's Aid on Delivery program support the Water Services Trust Fund of Kenya (Advani 2016). It offers water service providers access to results-based finance to invest in pro-poor water infrastructure, such as urban household connections and public water kiosks. Service providers agree to meet targets for higher consumer consumptions, increased revenue, and reduced water losses.

The UK's Foreign, Commonwealth, and Development Office (formerly called the Department for International Development) has long led performance-based funding approaches, having supported the Global Partnership since its inception while building its own results-based funding portfolio with more than \$2.7 billion invested across 19 programs as of 2016 (Clist 2019). An approximately \$135 million performance-based "WASH Results Programme" has been implemented in South Asia from 2013 to 2022 by Plan International, the Sustainable WASH in Fragile Contexts consortium led by Oxfam, and the Sustainable Sanitation and Hygiene for All program led by SNV (Howard and White 2020).

The Uptime Catalyst Facility, created in 2020, piloted a results-based funding approach for post-construction rural water maintenance services. Its design built upon three metrics (reliable waterpoints, water volume, and local revenue) and eventually arrived at a "revenue matching" contract design, with supplementation of user payments and matching for a portion of locally-generated revenue. Service providers implement water services up front and are remunerated for results achieved, using a payment formula. Standardized contracts and performance metrics make the model easily scalable. Expansion to serve several million people is ongoing in African, Asia, and Latin America (McNicholl et al. 2021).

The UK government and USAID support the National Rural Water Supply and Sanitation Programme in Mozambique (Rudge 2019). It links 40% of a nearly \$40 million grant to the government of Mozambique to

eight performance indicators, including the number of people in rural areas with access to new improved drinking water infrastructure and the percentage of contracts (works and services) procured at district level. The performance-based approach is being tested in 20 districts in two provinces of Mozambique (Nampula and Zambezia). Initial evaluation found key enablers: alignment with government priorities and effective transfer of responsibility and accountability for implementation by the sub-national government. Key challenges included ensuring domestic increases in financing for capital and operational expenses.

East Meets West (aka Thrive Networks), an international nongovernmental organization, has implemented several output-based aid programs. The Global Partnership provided support in 2007 for a rural water program in Central Vietnam, followed by a second activity in Vietnam's Mekong Delta region (Nguyen, Ljung, and Nguyen 2014). Multiple management models included private enterprises, provincial authorities, and East Meets West itself assuming the role of service provider. Formally supported by the Vietnamese National Target Program for Rural Water Supply and Sanitation since 2013, the program reached its preset target (ceiling) for new household water connections, leveraging considerable local investment by offering only a partial subsidy to low-income beneficiaries. Customer satisfaction surveys showed that introducing private water operators offered performance advantages, such as fewer water losses and breakdowns. A World Bank evaluation showed exceedance of infrastructure sustainability targets, as well as efficiency improvements in water schemes and construction time (World Bank 2022c). On the flip side, the financing did not initially benefit locations with the highest poverty and ethnic minority concentrations.

CUTTING EDGE: Although not set up as results-based financing per se, the Stone Family Foundation is piloting a flexible “revenue royalty finance facility” in Cambodia in partnership with GRET, iSEA, and the Bank for Investment and Development of Cambodia, to incentivize good performance and encourage water providers to expand their service networks to 100% of households (The Stone Family Foundation 2019). Following extensive market research, the approach will package “revenue finance” with complementary technical and marketing support. Revenue finance links loan repayment terms for water suppliers to their actual revenues. The repayments are targeted to multiply the original loan sum by 1.3–1.6 (as opposed to a fixed interest rate) over an estimated period of nine to fifteen years. The lender receives a percentage (e.g., 14%) of supplier revenues, so loan repayment amounts adjust with seasonal variations in water usage. Unlike traditional fixed-term loans, the loan can be repaid more quickly if the service provider performs well.

STAGE OF DEVELOPMENT

STATUS

Widely implemented

MARKETABILITY

An evaluation of results-based financing in WASH programs commissioned by the Bill and Melinda Gates Foundation concluded that 94% achieved pre-specified output targets, but it could not determine whether they were more efficient or sustainable than conventional approaches (Castalia Strategic Advisors 2015). These findings were reinforced by analysis of a subset of investments funded by the UK-funded WASH Results Programme: specific programs met their targets consistently, but water suppliers tended to use conventional rather than innovative approaches (Howard and White 2020). Another non-WASH-related evaluation of eight UK-supported payment-by-results programs found no ideal implementation examples or specific evidence of greater effectiveness, but rather a range of successes and failures as well as normal pressures that affect all aid spending (Clist 2019).

Performance-based approaches may not be universally superior financing options, but they show promise and are most appropriate when:

- Targeted outcomes are well defined, measurable, and plausible to accomplish;
- Service providers have experience delivering desired outcomes and show interest in finding and generating efficiencies;
- Data sources and monitoring systems can be formulated to reliably track and validate outcomes;
- Funders are comfortable giving service providers room to innovate to achieve outcomes; and
- Costs of achieving outcomes can be reliably priced to increase cost-effectiveness for donors and enhance operating efficiencies by the implementer.

SCALE OF DISSEMINATION

Performance-based funding programs are growing in popularity across several world regions, including Africa and Asia. They are also being promoted in Latin America (IFC 2013).

INNOVATION 5: DEVELOPMENT IMPACT BONDS

BACKGROUND

Social impact bonds are one type of performance-based financing (see Innovation 4) used for public service improvements in low- and middle-income countries. Social impact bonds first launched in the UK in 2010 (Center for Global Development and Social Finance Ltd 2013). Like other performance-based financing structures, the payer (outcome funder) disburses funds only when pre-agreed outputs and/or outcomes are achieved; however, social impact bonds involve an additional intermediary impact (social) investor that provides upfront capital to the governing authority or service provider, aiming to recoup the investment with a portion of the interest. The focus on results makes impact bonds attractive for development finance, as they intend to increase program efficiency and effectiveness (Clarke, Chalkidou, and Nemzoff 2019).

SOLUTIONS

Development impact bonds (DIBs) spun off from social impact bonds. These involve a tripartite contract between a service provider, an impact/angel investor (seeking both financial and societal returns), and an outcome sponsor such as a development finance institution or government (Clarke, Chalkidou, and Nemzoff 2019). In addition, a DIB organizer can be recruited to structure the transaction, and a verification agent can be independently appointed to measure the results achieved. For rural water, bond investors would finance a program aimed at achieving a particular outcome or set of outcomes (e.g., extending household water connections), while service providers (e.g., public utility, private company, nongovernmental organization, or partnership) would be responsible for delivery. If and when the outcomes are verified by a third party, then the outcomes funder (e.g., government agency) should repay the social investor. In general, more successful programs give higher returns to investors.

The rationale for involving the impact investor as an intermediary is to plan the arrangement and provide the service provider with the capital required to execute planned activities (Center for Global Development and Social Finance Ltd 2013). DIBs enable development finance to retain a results-based structure without placing all of the risk on service providers themselves; rather, some risk is shifted to the impact investor (USAID and Palladium 2018). Minimizing overall risk requires careful program design, detailed costing of capital requirements and intended outcomes, and selection of a proficient service provider with a good track record of results. Figure 10 illustrates the steps of implementing and completing a DIB, from contract signing to investment repayment.

FINANCIAL SCALE CATEGORY



Global

STATUS



Conceptual



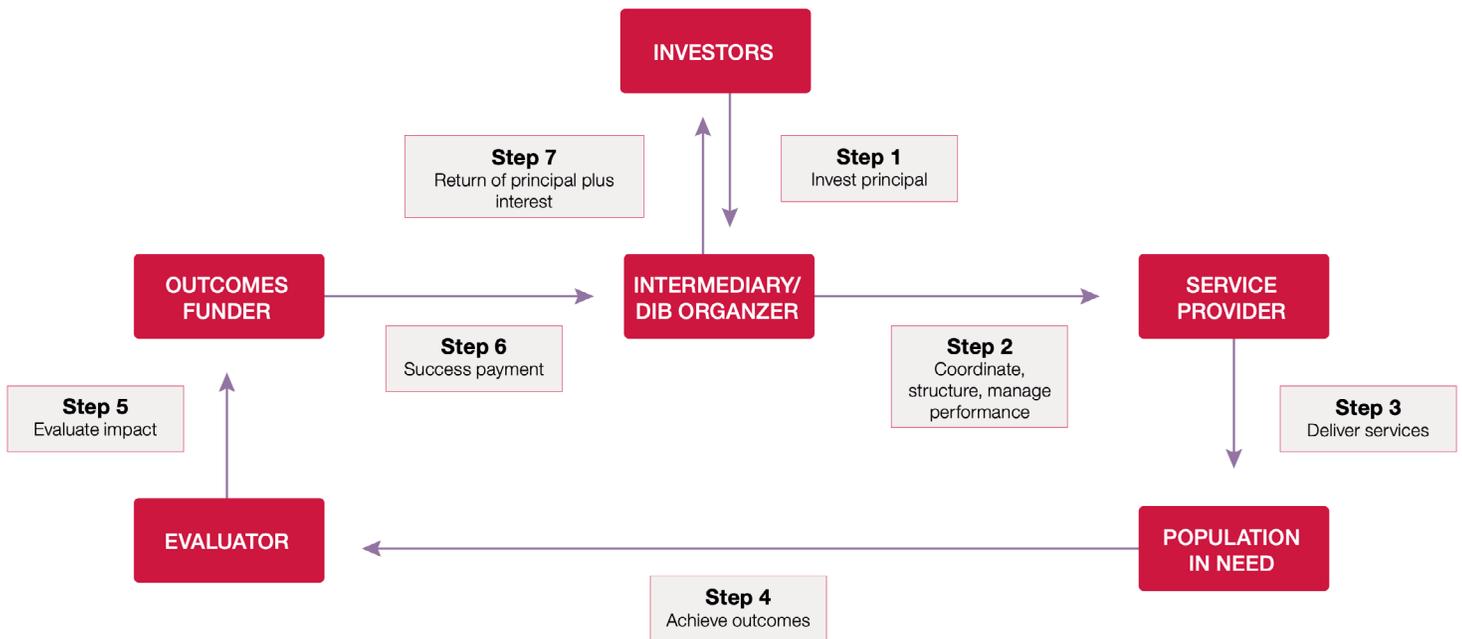


Figure 10. Structure of development impact bond (Source: USAID and Palladium, 2018)

PROS

- Private investors can leverage funds to promote **social good**, which in turn promotes economic stability.
- DIBs create space for more **innovation, local problem-solving, and adaptation** by incentivizing investors and implementers to consider the most effective ways to deliver outcomes, rather than meeting a set of pre-determined input metrics.

CONS

- DIBs can be **complex** with high transaction costs, and subsidization may be needed initially (Center for Global Development and Social Finance Ltd 2013).
- To date, no DIBs have been structured for **water services**. Given varied values and structural limitations of water development finance institutions, they may not hold universal appeal.

- DIBs create incentives for implementing **feedback loops, data collection, and performance management systems** that track desired outcomes (Center for Global Development and Social Finance Ltd 2013).
- Involvement of a third party may **reduce risks** for governments and development partners of potentially funding non-performing or under-performing programs, as they pay only after verifying successful results.
- Risk mitigation requires servicers to have sufficient subject-matter expertise and **practical experience** in the country and setting where they will be operating.
- Costs and outcome payments must be **calculated with great care**, often by a third-party organizer, which raises activity costs.
- Data **transparency** and openness must be in place to foster a learning community (Center for Global Development and Social Finance Ltd 2013).

EXAMPLES

DIBs in non-WASH development fields have generated much interest among investors and donors, leveraging over \$200 million in upfront private capital for social services worldwide since the model's inception (Clarke, Chalkidou, and Nemzoff 2019). As of 2018, seven DIBs have focused on improving agricultural, education, employment, and health outcomes for people and communities, with nearly \$55 million set aside for project outcome payments. If outcome targets are achieved, private investors receive all of their upfront investment back; if the service provider achieves outcomes above prespecified target levels, investors receive interest (up to 7–15%); or, they may lose money if outcomes are not achieved. DIB case studies confirm design challenges (Belt, Kuleshov, and Minneboo 2017; Oroxom 2018; Convergence, Palladum, and Bartha Centre 2018; Kitzmuller et al. 2018). In particular, managing stakeholders' different perspectives and priorities on funding and contract structures has proven difficult (Clarke, Chalkidou, and Nemzoff 2019).

A pioneering sanitation DIB used in Cambodia offers lessons on the benefits and challenges specific to WASH services (iDE 2022). As shown in Figure 11, the institutions involved include:

1. USAID as the outcome funder;
2. The Stone Family Foundation as the impact investor; and
3. iDE as the service provider (an international nongovernmental organization that has operated in Cambodia for many years, facilitating uptake of sanitation services in rural areas).

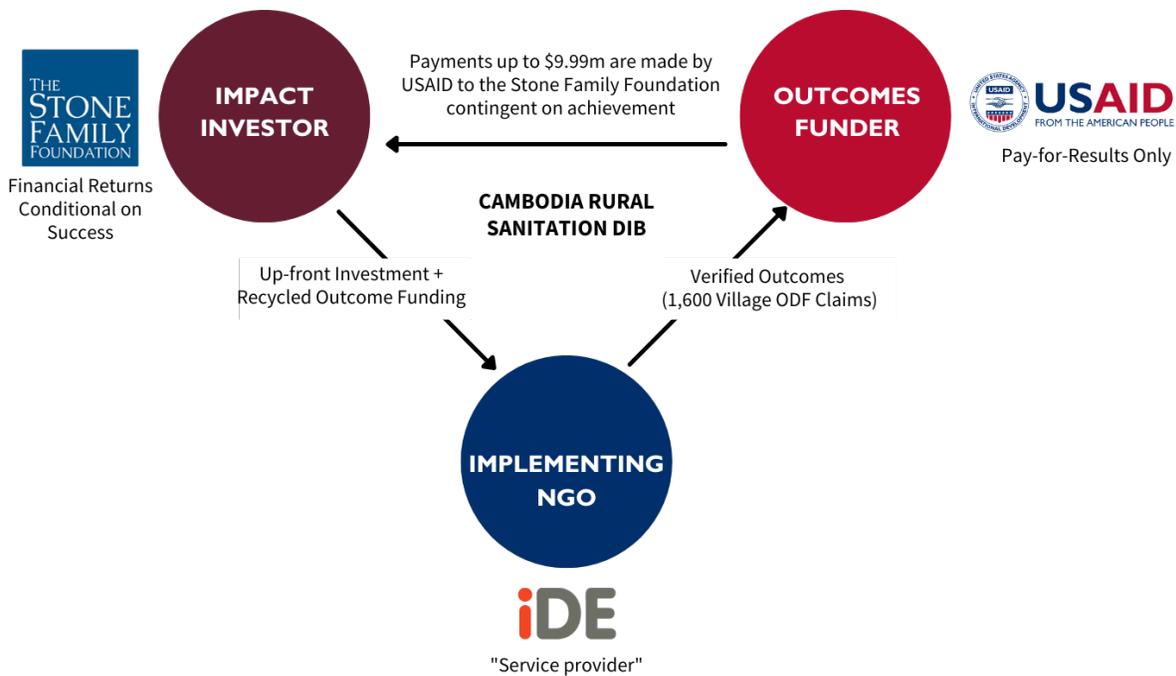


Figure 11. Cambodia sanitation development impact bond structure (Adapted from iDE 2022)

The Cambodian DIB launched in 2019 and will run through 2023, with a maximum of \$9.99 million in outcome-based payments from USAID back to the Stone Family Foundation (iDE 2022). The DIB aims to improve rural community sanitation services, especially for the poor and hard-to-reach groups (e.g., women, children, people with disabilities, and older people) across six provinces in Cambodia. Specifically, villages must achieve open-defecation-free status, as a means of reducing disease burdens and preventing drinking water contamination. Outcome payments can be claimed in tranches (every 6 months) dependent on local village government reports collated and submitted by iDE. To mitigate risks, the financing structure relies on a detailed operational model embedding the cost of services (plus risk premiums). This exercise envelops not just “core” activities but also a number of “soft” (i.e., enabling or supporting) activities. Activities in the latter category include capacity building, communications, engagement with local authorities, and sourcing materials.

After the first 18 months, the program had enabled 750 villages (out of the targeted 1,600) to be declared free of open defecation (Morse 2021). From the service provider’s perspective (iDE), the DIB provides implementation flexibility and removes some of the project governance,

design, and management burden, thus conserving costs. This flexibility is particularly important given the focus on harder-to-reach villages, which benefit from testing and innovative approaches that can be fine-tuned as the program rolls out.

STAGE OF DEVELOPMENT

STATUS

Conceptual

MARKETABILITY

According to Clarke, Chalkidou, and Nemzoff (2019), the market growth prospects for DIBs are high. Brooking Institution Global Impact Bond Database and UBS Optimus Foundation projections anticipate a more than five-fold increase in the volume of DIBs, to cumulatively exceed \$2 billion by 2023 (Gustafsson-Wright 2021). Still, DIBs remain under-studied (Anderson, Sturla, and Oroxom 2019) and unattractive to private commercial investors due to higher risk (Starr 2018), leaving them more targeted toward impact investors, who also have other financing options.

It may be too soon to assess whether DIBs generally deliver their intended outcomes. Overall, there is limited information about their cost-efficiency (Clarke, Chalkidou, and Nemzoff 2019). Related impact information mainly comes from published case studies on the Asháninka Impact Bond in Peru and the Educate Girls DIB in India.

SCALE OF DISSEMINATION

No DIBs have yet been trialed for rural water services in low- and middle-income countries, although one (in progress) seeks to address sanitation in Cambodia.

INNOVATION 6: STANDARDIZED LIFE-CYCLE COSTING

BACKGROUND

Philanthropic rural water supply funding has focused almost to a fault on increasing infrastructure capital, leaving substantive shortfalls between current expenditure planning and needs to sustainably meet global development goals (Libey, Adank, and Thomas 2020; Hutton and Varughese 2016). Similarly, national government expenditures on water go almost exclusively toward infrastructure, while other important cost components like planning and designing, capital maintenance, source water sustainability, and water quality receive few-to-no allocations (Reddy et al. 2012). Meanwhile, holistic financial planning tools have not seen consistent, widespread adoption in low-resource settings. As time passes, this leaves many water systems constructed in low-resources settings non-operational.

“Asset management” broadly entails a systematic approach to governance and realization of value from assets overseen by an individual or group, over their entire life cycle. For water supply infrastructure, this refers to management approaches that minimize ownership and operational costs, while at the same time delivering good services to customers. Tools to achieve asset management include long-range planning, life-cycle costing, proactive operations and maintenance plans, capital replacement plans, and cost-benefit analysis. These tools have been widely adopted in high-income, urban settings, but rural water service providers in low-income settings (predominantly nongovernmental organizations) may lack capacity or common methods to describe and report financial sustainability indicators.

SOLUTIONS

One tool, life-cycle costing, has been used for many years to account for all costs of a product, system, or program from its inception to disposal (Sherif and Kolarik 1981). “Life-cycle” costs represent the aggregate financial expense of ensuring delivery of adequate, equitable, and sustainable water services to a specified population (Fonseca et al. 2010). Beyond calculations, the approach seeks to mainstream life-cycle considerations into institutional processes. It covers all expenditures, such as hardware, software, operation, maintenance, source water protection, training and planning support, replacement costs, and shifts needed to meet water demand. To accurately assess financing needs, service providers should categorize different types of expenses and quantify the total requirement, as well as when costs and revenues accrue.

FINANCIAL SCALE CATEGORY



Adaptable to all scales

STATUS



Limited application

In low-income rural areas, standardizing approaches to life-cycle costing could help to clarify how much and what type of funding might be needed to sustain water supply operations. The WASHCost project from 2008–2013 (Fonseca et al. 2011; 2010) and the State of the Safe Water Enterprises Market study (Dalberg 2017) found that carefully quantifying and ensuring funding for full life-cycle costs (particularly capital maintenance expenditures) is critical to maintaining sustainability. A common framework and step-by-step approach were proposed to quantify and categorize life-cycle costs (Table 1).

TABLE 1. LIFE-CYCLE COST CATEGORIES¹

CATEGORY	ABBREVIATION	DESCRIPTION
Capital Expenditure	CapEx	Development of new water infrastructure
Operating and Minor Maintenance Expenditure	OpEx	Recurrent costs of operations water supplies such as salaries, transportation, treatment chemicals, and spare parts
Capital Maintenance Expenditure	CapManEx	Future expenditure on major maintenance and depreciation of infrastructure and equipment
Cost of Capital	CoC	Financial services and interest on debt
Expenditure on Direct Support	ExpDS	Pre- and post-construction support for local stakeholders or user groups (e.g., monitoring and responding to complaints or emergencies)
Expenditure on Indirect Support	ExpIDS	High-level policy, planning, monitoring, and capacity building for professionals and technicians

¹Source: WASHCost project (Fonseca et al. 2011), which builds on previous work from Sherif and Kolarik (1981).



PROS

- Life-cycle costing allows implementers and other stakeholders to visualize the full cost of service delivery, which **aids planning** and fundraising (Veenkant and Fonseca 2019). To make water supply efforts more sustainable, these expenses can also be captured in the initial capital raised.
- Common cost categorization frameworks allow implementers to **compare** service options.



CONS

- Water service modalities **vary greatly**, and applying a single framework to expense tracking could alienate certain types of implementers or fail to capture important nuances (Termes-Rifé et al. 2013). Benchmarking may lead to inappropriate comparisons among water systems in different countries or communities with underlying contextual variation.

- Understanding the full costs of ongoing maintenance and renewal allows implementers to put appropriate **savings mechanisms** in place, so funds will be available when needed.
- Maintenance **budgets become more realistic and accurate** when all expense categories are accounted for.
- Life-cycle costing can help managers predict when **replacement parts** will be needed and keep them on hand.

EXAMPLES

IRC developed and piloted a rural water life-cycle costing approach under the WASHCost project (Veenkant and Fonseca 2019; Table I), which aimed to capture the full costs of providing adequate services (rather than just the initial cost of infrastructure). The approach can be used to assess water services in rural communities as well as refugee and emergency settlements. Cost categories include construction, implementation, maintenance, and replacement.

The Rural Water Supply Network (RWSN) Directory applies the same life-cycle costing approach to profile a number of rural water service providers, such as 4Ward Development (formerly called Access Development) in Ghana; AguaClara in Honduras, Nicaragua, and India; and the BESIK Programme in Timor-Leste (Deal, Furey, and Naughton 2021). It encourages further discussion on financial analyses that would inform decision-making for public services investment.

An application of the life-cycle costing approach to 14 privately run water schemes in Vietnam highlighted its ability to discern long-term profitability of rural piped water systems, particularly with respect to asset depreciation and capital maintenance (Grant et al. 2020). The

- Collecting and analyzing data is **resource-intensive** due to context dependency, and it must be updated regularly. Smaller implementers may not have the staff or data management capabilities to conduct these analyses (Libey, Adank, and Thomas 2020).
- Life-cycle cost benchmarking could **redirect investment** toward less expensive systems. This could negatively affect fundraising for water supply projects that target more remote communities with limited infrastructure.
- Unanticipated changes in **currency** values, such as depreciation or inflation, could alter life-cycle accounting estimates (Fonseca et al. 2011).
- Actual infrastructure lifespans may be shorter than the estimated useful lifespan if stations are exposed to **harsh conditions** or lack preventative maintenance (Libey, Adank, and Thomas 2020).
- Life-cycle costing may **shift focus too heavily onto costs** rather than benefits. Some studies should be accompanied by cost-effectiveness or cost-benefit methods to emphasize the positive impacts of investment.

analysis pointed to options for improving the schemes' viability, such as subsidy and tariff adjustments. Another study in rural Andhra Pradesh, India, used life-cycle cost analysis to illustrate how gaps in upfront public investments in 43 villages led to service slippage due to poor operation and maintenance as well as water quality and source sustainability (Reddy et al. 2012). Infrastructure costs were overrepresented at project outset, and actual unit costs were found to be substantially higher than the official norms. In two districts of Amhara, Ethiopia, a 10-year study found that emergency water trucking and treatment costs greatly exceeded pre-planned costs of providing piped water, highlighting the importance of climate resilience (Godfrey and Hailemichael 2017).

STAGE OF DEVELOPMENT

STATUS

Limited application

MARKETABILITY

Life-cycle costing is widely used in high-income countries, where staff capacity and data tracking capabilities support completing this exercise on a regular basis. While life-cycle costing studies have been done in low- and middle-income countries, structural gaps in the water supply market prevent the practice from proliferating. More incentives are needed for implementers to track data and align on financial and operational metrics. Monitoring and evaluation web platforms like the Rural Water and Sanitation Information System (SIASAR Global)—now used in 14 countries—could be leveraged to track geocoded asset inventory and financial health (Smets and Serrano 2019).

Incentives might come from national governments, funding mechanisms, or technology providers who require standardized reporting. Improved subsidy designs that effectively target poor communities would also increase incentives for reporting and expense tracking (Andres et al. 2019; Cook, Fuente, and Whittington 2020). Technical assistance can play a role in expanding this practice, because smaller implementers may not have in-house finance and data management expertise to execute it or develop an internal strategy. In most cases, life-cycle costing analysis must be followed by efforts to obtain internal, external, or alternative financing arrangements, to ensure lasting water service delivery.

SCALE OF DISSEMINATION

Life-cycle costing has been applied globally in high-income settings, although it is less commonly used in low- and middle-income countries.

INNOVATION 7: BLENDED PUBLIC/ PRIVATE FINANCE

BACKGROUND

Commercial financing (lending or purchasing shares of investments at market or near-market rates) still represents a relatively untapped reservoir for expanding rural water supply funding. Only about 1% of the \$157 billion in global commercial development financing between 2012 and 2017 went to water supply and sanitation, as compared to 26% directed to the energy sector and 18% to industry, mining, and construction (OECD 2019b). Public development finance institutions offer below-market rate lending to governments or directly to utilities and other water service providers, which could dissuade private lenders (IRC n.d.; OECD 2019b). To counteract this pressure, development finance institutions must balance targeted funding and financing programs with capacity building to raise utility creditworthiness and attract additional resources.

Water supply operations in low- and middle-income countries has historically failed to attract private lenders for a number of reasons. Some service providers—particularly subnational providers—lack reliable revenues; they are constrained in their ability to raise tariffs and rely on limited tax recovery as well as inconsistent subsidies and development financing. Weak regulatory regimes mean service providers are not routinely able to provide accurate financial and operational data. Poor efficiency and governance thus create a high-risk environment for potential investors. In addition, private sector investment is sometimes limited by legal and institutional barriers, such as limited contract enforceability, unclear water tariff or public-private partnership policies, or prohibitions on pension fund investments in infrastructure bonds that have not been listed long enough on public exchanges (Goksu et al. 2017).

SOLUTIONS

Growing concern since 2015 about the financing gap needed to meet Sustainable Development Goal 6 has focused a spotlight on leveraging private sector investments (World Bank Group 2017; Leigland, Trémolet, and Ikeda 2016; Kolker et al. 2016). “Blended” finance refers to deployment of development finance (e.g., “concessional” or below market-rate lending and grants from development banks, as well as grants from philanthropic actors or other public institutions) to mobilize commercial finance investing at market rates from either

FINANCIAL SCALE CATEGORY

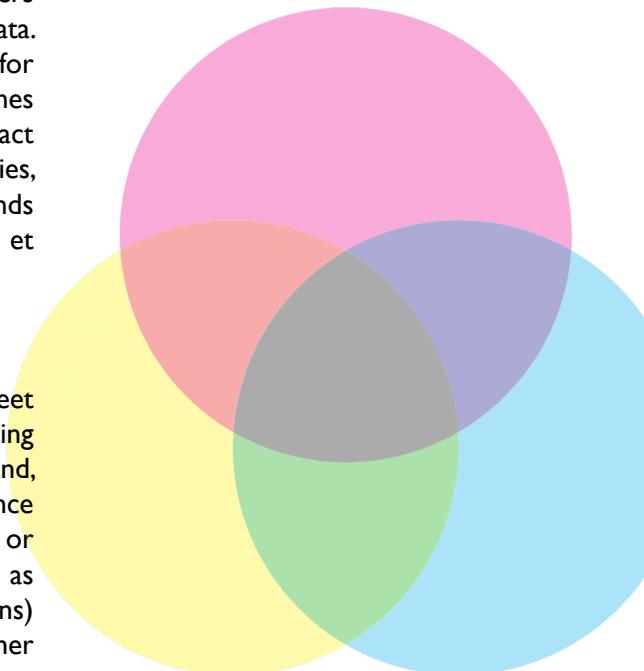


Adaptable to all scales

STATUS



Limited application



private sector banks or public investors (e.g., state-owned investment funds) (OECD 2019b). Its distinguishing element is strategic leveraging of public resources to attract additional private finance.

Combining development finance with private investment can assume different structures to reduce risk, employing a range of instruments (e.g., equity, debt, partnerships, technical assistance, grant-funded transaction design, guarantees, or insurance; Figure 12; OECD 2019a; Convergence 2023). The most common blended finance instruments across the development sector from 2018–2019 were direct investments in companies or subsidiaries, loan guarantees, “syndicated” loans, and lines of credit (OECD 2019a). Syndicated loans come from a group of collaborating financial institutions (a loan syndicate) to a single borrower, reducing the risk and buy-in amount needed for each individual group and/or ensuring sufficient specialized expertise. Alternatively, a smaller amount of pure grant funding may be used to support technical assistance or subsidies, with the goal of attracting other investors.

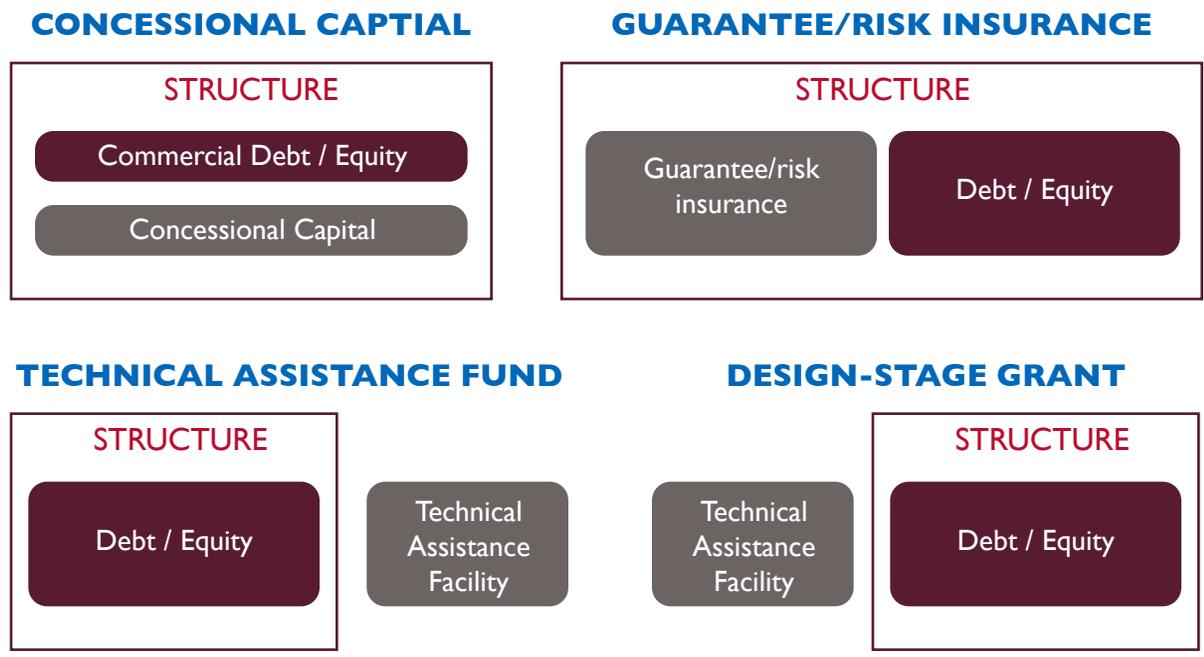


Figure 12. The four most common blended finance structures (adapted from Convergence 2023)

Because water sector investments can assume quite different scales and risk profiles, blended finance must be sensibly matched with the financing need in a given context (Blended Finance Taskforce and WaterAid 2022). These options have mainly applied to urban water suppliers. As noted previously, rural water suppliers have a lesser ability to repay commercial investors and may require a greater balance of concessional funding, relative to larger urban water systems. Importantly, it does not represent a panacea for the water sector financing gap. While it can shift risks and enhance returns, blended finance does not aim to transform all risky or non-viable projects or enterprises into attractive opportunities for commercial investors (Rossmann 2021).



PROS

- Blended finance could **unlock private sector resources** not currently reaching the water sector. It can reduce borrowing rates, allow extended schedules, and attract commercial lenders by reducing risk perceptions (Goksu et al. 2017; Convergence 2019).
- Various blended finance instruments are increasingly **deployed in other development sectors**, such as energy, banking, and industry/mining/construction (OECD 2019b; 2019a).
- Market-rate financing of creditworthy water service providers allows **reallocation of public funds** where they are most needed (Leigland, Trémolet, and Ikeda 2016).
- Private finance has some **benefits over concessional finance**, including reduced delays in disbursement and more flexible use of funds (Goksu et al. 2017).
- The **transparency requirements** of private lenders (e.g., for subsidies) can drive increased accountability and governance discipline (Leigland, Trémolet, and Ikeda 2016).



CONS

- **Borrowing terms** from private lenders will normally be less favorable than concessional loans up front, although long term savings are possible, especially in countries with high risk of shifting currency values (IRC n.d.; Goksu et al. 2017).
- Most water supply blended finance experiences have come from urban areas of middle-income countries and have not been **replicated at scale**, due to “foundational” obstacles among governments, service providers, and finance actors (Pories, Fonseca, and Delmon 2019).
- **Targeted technical assistance** is likely needed initially to stimulate both financial institution supply and service provider demand, although development institutions may not be able to commit to long-term support (USAID 2022).
- **Transaction costs** for smaller blended financing projects can be prohibitively high, with each investment requiring separate commercial and legal due diligence (Blended Finance Taskforce and WaterAid 2022).

EXAMPLES

Although not all water-related “public-private partnerships” leverage public funding to attract commercial finance, these long-term collaborative arrangements among one or more government and private sector entities have been in place for decades in low- and middle-income countries, including throughout Africa, with encouraging results. Overall, private operators have tended to be more efficient than governments at managing construction, service delivery, and asset maintenance (World Bank Group 2014). One frequently documented benefit among several Sub-Saharan African examples, where private management covers an estimate one-third of small piped water schemes, has been reduction of “non-revenue” water, or water losses for which production costs are never recovered. Among small-scale water providers in Uganda, a private sector participation model led to expanded coverage and financial performance with only modest tariff increases (World Bank Group 2014; Hirn 2013). Active connections tripled over 10 years with tariffs rising less than inflation.

In Madagascar, a host of rural community water user committees and private water operators have signed long-term concession agreements in which a private company invests in the water system to increase household access, generate more revenue, and share profits. This model has been replicated over roughly 15 years with donor support, such as USAID’s Rural Access to New Opportunities in Water, Sanitation, and Hygiene (RANO WASH) activity (Tetra Tech 2021).

Another long-running example of blended finance comes from Benin. Between 2007 and 2017, more than half of Benin’s rural piped water systems transitioned to private operation and maintenance contracts known as *affermages* (Comair, Delfieux, and Dakoure Sou 2021; Migan and Trémolet Consulting 2015). In these agreements, a private operator collects tariffs and then retains a percentage of an agreed-upon price per unit of water sold, turning over the remainder to the contracting authority (Janssens 2011). Initially hampered by weak local private sector capacity and poor contracting arrangements (World Bank Group 2018), the World Bank spearheaded a “subsidized concession” model that obligated private operators to match investments with actual demand (Migan and Trémolet Consulting 2015). The initial pilot with 10 private operators successfully rehabilitated all water systems with no additional costs to the customers (World Bank Group 2018); however, subsequent scale-up experience brought a pivot to regional contracts to attract more professional operators. In 2022, a 10-year public-private partnership was formed with a consortium of French companies (Eranove, UDUMA, and Vergnet Hydro) to rehabilitate, extend, and operate rural water systems for 100% customer coverage (Marteau 2022). Public funds will ensure private connections and tariffs remain affordable.

Affermages have similarly been applied in Senegal, where since 2014, the Office of Rural Borehole Management has owned and managed most of the country's rural water system assets, while delegating their operation to private companies (Diallo 2015). Combined World Bank and national government funds support expansion and renewal of infrastructure assets with lifecycles longer than 10 years, and private operators must renew and rehabilitate assets with lifecycles under 10 years.

Several varied blended finance examples come from Cambodia. In one case, a pilot of “viability gap” funding, a type of public subsidy, incentivized expansion of Cambodian rural water operators into previously unserved areas; the Investing in Infrastructure program, sponsored by the Australian government and implemented by Palladium, leveraged more than \$24.6 million in private capital with water connections offered to nearly 180,000 rural households (Fogelberg 2018; 2020). In another case, the French development agency extended a concessional line of credit to a Cambodian commercial bank, enabling them to extend more attractive loan terms (e.g., lower collateral requirements) to small water service providers mostly located in rural areas (World Bank Group 2016a). Finally, technical assistance alone from USAID helped the semi-urban Kampong Chamlong Water Supply Company raise \$2.2 million in commercial loans from 2018 to 2022, after the service provider was carefully vetted for eligibility (USAID 2022).

The experience of the Kenya Pooled Water Fund highlights the challenges involved even with well-reasoned blended finance design. Set up as a bond product with liquidity and default guarantees to encourage investment in Kenyan water service providers, the Fund was expected to issue \$30–50 million in loans annually between 2018 and 2022, but never closed a single investment. The economic shock of COVID-19 was one factor, but an array of other factors—including a shortage of creditworthy borrowers—also played a role (WASH-FIN 2021).

In 2018, UDUMA (a subsidiary of the French group, Odial Solutions) secured a blended finance package for its operations in Mali, combining grants from two bilateral donors (the Netherlands Ministry of Foreign Affairs and the UK's Department for International Development) with two commercial loans, along with a 30% guarantee on one loan and a second guarantee consisting of the life insurance policy of UDUMA's CEO (Wilk 2019). These difficulties in securing commercial partners offer another cautionary tale that blended finance remains in early stages.

STAGE OF DEVELOPMENT

STATUS

Limited application

MARKETABILITY

Further proof-of-concept is required to evaluate blended financing to drive rural water supply performance. It faces a dual challenge: persuading commercial lenders that water supply represents a lucrative investment opportunity and persuading water service providers to seek loans at rates higher than those routinely offered by development finance institutions. Blended finance projects create an evidence base for effective public investment and in turn, incentivizing the capture of better financial and impact data (Convergence 2019). Objective selection criteria may help “prime” service providers to continue the behaviors and actions that support blended finance (USAID 2022). Building the foundations for blended finance will require a transition period with accompanying public sector support, to allow for a paradigm shift on the part of both borrowers (who face increased pressure to manage operations efficiently) and lenders (who often do not know the market well enough to participate in investment opportunities).

While they take time, these adjustments have taken place in other sectors, most notably energy (IRC n.d.). Pories, Fonseca, and Delmon (2019) detail foundational issues ranging from governmental sector planning and tariff setting to service provider project preparation and financial market distortions. Experiences with the approach will elucidate the degree to which blended finance can work at large scales, but transformation is unlikely to occur rapidly. Stimulating providers to increase competitiveness with other sectors may require policies and incentives that address underlying barriers to their efficient operation and governance (Kolker et al. 2016). Goksu et al. (2017) suggested the following top priorities for governments to grow commercial involvement in water sector financing:

- Identifying the approximately one-third of all providers who collect between 100% and 150% of their operating costs as appropriate candidates for commercial financing.
- Understanding and flexibly selecting from the variety of blended financing arrangements, as tailored to the type of investment, the water service provider, and local market conditions.

Other financing trends may lend a helping hand. Performance-based funding models (see Innovation 4), while unlikely to attract private investors, could improve the creditworthiness of service providers over time (Rossmann 2021). Also, pooled vehicles – with many smaller projects or enterprises aggregated into a single investment – allow for a sufficiently large scale to interest commercial investors (Rossmann 2021). Partnerships among lenders may help to overcome risks, invite expertise, and reduce transaction costs.

SCALE OF DISSEMINATION

Although some examples (e.g., Madagascar, Benin, Cambodia) have applied blended finance to rural water supply in low- and middle-income countries, it remains at a proof-of-concept stage. Blended finance is possible where rural water provision is more organized and mature and where people pay consistently, justifying lending. This is more likely to be case in middle-income economies.

MODELS FOR BOLSTERING FINANCING

Research has increasingly shed light on the complex interactions among financial, technical, and social aspects of rural water supply. One systems model applicable to low- and middle-income countries prioritized water system functionality and community factors as having more influence than finance, but finance as having more influence than management factors (Walters and Javernick-Will 2015). A conceptual framework for rural water supply sustainability from Richard Carter and collaborators has evolved since 2009 (Montgomery, Bartram, and Elimelech 2009). This “sustainability chain” consists of four interconnected parts (Carter 2019):

- Motivation (community commitment);
- Money (available short-term for repairs);
- Maintenance (skills, parts, tools, and transportation); and
- Mayday (a pathway to request assistance from a responsive support organization when needed).

The FundiFix Model for Africa follows the rationale that pooling rural water operation and maintenance services at larger scales reduces risk. It outlined four similar dimensions for maintaining services (REACH 2017):

- Professional services (i.e., performance-based, making investment or payment contingent on service delivery);
- Sustainable finance (i.e., both stable and adequate);
- “Smart” monitoring (including data flows, analytics, and use for regulatory and management decisions); and
- Institutional coordination (separating regulatory and service delivery roles).

Given these general building blocks, specific local contexts may necessitate a tailored understanding of the major financial or other barriers to rural water supply and potential strategies to overcome them. Three main aspects of ongoing financial health for water suppliers include infrastructure costs, financial management, and cost recovery (Walters and Javernick-Will 2015). Marks et al. (2018) noted from 20 case studies of rural water supplies that two common conditions, good financial management and user participation in project decisions, underlaid sustainable service delivery. Professionalizing financial management involved metered water billing, formal reporting to water users, and compensating staff. Thus, financial skill training, professional

certifications, and accountability requirements might help to embed operational capacity for further financial innovation. The Sustainable WASH Systems Learning Partnership highlighted extended time frames, legal expertise, and collaborative learning approaches as critical to a sustainable rural water sector (Koehler et al. 2022).

Although an older concept, one commentary recommends greater extension of public revolving loan funds to low- and middle-income countries (Savoy 2022). These permanent national or state funds allow rural service providers to borrow money for costly infrastructure upgrades, essentially buffering the time delay between when money is needed to start a water project and its incremental cost recovery over decades. For example, the United States Environmental Protection Agency, Department of Agriculture Rural Development, and Department of Housing and Urban Development offer loan and grant programs that help financially stressed small rural communities extend or improve drinking water systems (US EPA 2022). In the Philippines, a water revolving fund set up in 2008 blends development assistance from the US and Japan with domestic public funds, using commercial financing to lower borrowing rates (World Bank Group 2016b). Small fixed interest rates make the central funding pools self-sustaining over time. Going beyond financing, the improved oversight of project and service implementation, as well as technical assistance for financial management and maintenance, could help to enhance spending efficiency and cost conservation.

Serving poor and vulnerable rural populations will likely require an adequate portfolio of both public and private finance in most countries (Fonseca and Pories 2017; OECD 2010). A 2019 report acknowledged 10 foundational issues to elaborate on the enabling environment for mobilizing WASH financing (Pories, Fonseca, and Delmon 2019). These covered both financing supply and demand, and were grouped by country government and sector practices, service provider capacity, and the broader supply of finance. Some key recommendations included:

- Government regulatory oversight for both water service quality and tariff setting;
- Financial and performance accountability mechanisms, including standards, performance targets, incentives, and penalties;
- Service provider re-orientation toward customer service, to attract both users and funders;
- Clear mandates for which service providers (and funders) serve marginalized populations; and
- Global finance coordination and technical assistance for attracting commercial investors.

A review of rural water economics in Africa (Hope et al. 2020) largely agreed with others' findings and confirmed the following policy directions:

- Encouraging larger-scale organized networks among rural water service providers: Fragmented rural water points should reflect a coherent architecture of planning, management, and monitoring.
- Unlocking rural water user payments by increasing their perceived value to consumers: Service delivery should emphasize responsiveness to consumer demand (which drives market competition), as well as tracking and addressing inequalities and discriminatory practices.
- Designing and testing performance-based funding models (Innovation 4) at national and regional scales: This will require longer-term thinking, political acceptance, and replication and validation of models currently being piloted.

Regarding the first direction, evidence on rural water service consolidation shows it can offer substantive benefits, particularly where rural service providers are small, have weak capacity, and/or operate informally (REAL-Water 2022). Consolidation likewise faces a number of challenges, such as geographic distance, administrative boundaries, resistance to power shifts, limited tariff collection feasibility, ambiguous responsibility, or inadequate community consultation. These efforts are more likely to succeed when introduced within broader governance reforms that address rural water financing and regulatory obstacles.

Examples of ongoing broad-based efforts to address rural water financing obstacles include the Sanitation and Water for All partnership's mutual accountability mechanism, financial data sharing such as in the Global Analysis and Assessment of Sanitation and Drinking-Water reports, time-limited development challenges such as the Jal Javeen Mission, and promotion of grassroots involvement as seen in the Financing Locally Led Climate Action program in Kenya. Rush and Marshall (2015) suggested that a larger portion of financial resources be dedicated to innovation. Entrepreneurship and incubation models, such as Safe Water Enterprises (akin to decentralized franchises) and Water Accelerators, have growing potential to energize rural water supply (Wehn and Montalvo 2018; Dalberg 2017; Ovink and Lampen 2021).

CONCLUSIONS

SUMMARY AND RECOMMENDATIONS

Table 2 summarizes the pros and cons of each financial innovation side-by-side. Specific to rural water provision in low- and middle-income countries, most innovations remain in pilot or limited-scale application. Additional trials and learning over time will likely better define which approaches work well in which settings and contexts. Rural water financial innovation must proceed hand-in-hand with technological and management innovation (see companion report, Technological Innovations for Rural Water Supply in Low-Resource Settings). Trends and opportunities observed across the financial innovations include:

- Increasing focus on expanding piped household water access into peri-urban and rural areas;
- Greater partnership and cooperation among the public, nongovernmental, and private sectors, as well as inclusion of local water users;
- Direct targeting of funding and financing to support higher JMP water service levels and global development goals; and
- Overall digitalization of rural water funding and financing activities.

TABLE 2. OVERVIEW OF FINANCIAL INNOVATION PROS AND CONS

INNOVATION	PROS	CONS
Village savings for water	<ul style="list-style-type: none"> • Can self-manage for several years with limited external support • Have robust accountability mechanisms • Build social capital among members to promote collective action 	<ul style="list-style-type: none"> • Susceptible to disintegration (i.e., disbanding) • Must connect with reliable, skilled service providers • Integration with water payments may benefit non-members
Digital financial services	<ul style="list-style-type: none"> • Dramatically improve fee collection efficiency, especially for prepaid water services • Digital data can be used for analysis or decision-making • Automates customers' financial planning 	<ul style="list-style-type: none"> • Customers and operators require local training and troubleshooting support • Equipment requires continued maintenance and replacement parts • Poor connectivity could intermittently interfere with payment technologies
Water quality assurance funds	<ul style="list-style-type: none"> • Provides long-term support for local capacity building • Offers a cost-efficient approach for donors • When used to support water quality testing, professionalizes monitoring and enables managers to respond more quickly to contamination issues 	<ul style="list-style-type: none"> • Contracts and partnership arrangements take time and legal expertise to set up • Guarantor requires transparent access to payment information and resources to carry out due diligence • Funds may draw down over time, if repayment is inconsistent

Performance-based funding	<ul style="list-style-type: none"> • Codifies accountability of aid recipients, reducing risk to donors and investors • Can accelerate efficiency gains by incentivizing incremental service improvements 	<ul style="list-style-type: none"> • New schemes involve upfront design effort, as well as ongoing management and monitoring costs • Careful performance verification is needed to ensure borrowers are incentivized to innovate • Added labor burden may reduce interest among smaller service providers
Development impact bonds	<ul style="list-style-type: none"> • Like performance-based funding, may promote innovation, local problem-solving, and adaptation • Involving a third party reduces risks for governments and development partners, who pay only after verifying a successful result 	<ul style="list-style-type: none"> • Can be complex to design and execute, with high transaction costs • To date, none have been structured for water services • Service providers must have sufficient subject-matter expertise and practical experience in the area of operation
Standardized life-cycle costing	<ul style="list-style-type: none"> • Allows visualization of the full cost of service delivery, which aids planning and securing funding • Makes operation and maintenance budgets more realistic and accurate • Motivates implementers to arrange appropriate savings and investment mechanisms 	<ul style="list-style-type: none"> • Collecting and analyzing data is resource intensive, and costs must be updated regularly • Applying a single framework could alienate certain implementers or fail to capture important nuances
Blended public/private finance	<ul style="list-style-type: none"> • Can unlock private sector resources by reducing risk perceptions • Transparency requirements of commercial lenders increase financial discipline • Private financing for the most creditworthy water service providers allows redirection of public funding where subsidies are most needed 	<ul style="list-style-type: none"> • Borrowing terms are initially less favorable than concessional loans • Most water supply experiences come from middle-income countries and have not been replicated at scale • Not all rural water service providers can be made creditworthy

Financial investments are increasingly weighed relative to the service improvement rendered; rural water supplies are typically characterized moving up a service “ladder,” ranging from no service to unimproved, limited, basic, or safely managed household drinking water service (WHO UNICEF Joint Monitoring Programme (JMP) 2017). This type of benchmarking helps managers compare costs and encourages incremental improvement, although other nuances (e.g., actual distance, water quality, social conditions, public health, and water security) may differ among services within the same category. Mobilizing the financial resources needed large swaths of the population to the top of the service ladder quickly may not be realistic, lending support to an incremental improvement approach (Rush and Marshall 2015). In the meantime, common reporting metrics and periodic reevaluation of rural water supply financial flows and shortcomings (WHO/UNICEF 2021; World Health Organization 2019) encourages evolution of global development goals and priorities.

Specific decision-making weighs numerous factors, including values and politics, but ideally should be informed at least in part by reliable, salient evidence (Bartram and Setty 2021). At the local scale, individual

rural water projects must consider their actual projected expenses and revenues to evaluate what amount and form of financing might best meet shortfalls. An example of a cash flow analysis for a rural water project (Figure 13) from The Aquaya Institute’s Water Business Kit (Aquaya 2013) helped to elicit which costs would be incurred and what profit margins would be expected over time. At a global level, standardized life-cycle costing (Innovation 6), cash flow projection, and other decision support tools need to be endorsed, simplified, and disseminated to users. Then, sharing local research and application experiences can provide a feedback loop to better understand and continue the cycle of improving rural water supply financing approaches over time.

Monthly Kenyan Water Treatment and Vending Business Sample

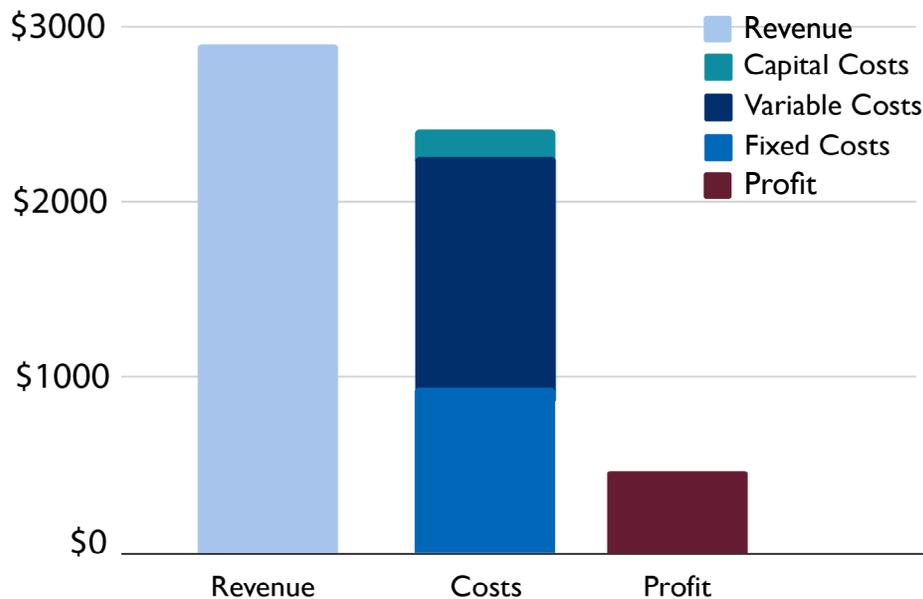


Figure 13. Example of a cash flow calculation that projects costs and revenues (in U.S. dollars) for a water supplier in Kenya (Source:Vanessa Guenther,Aquaya Institute; adapted from Aquaya 2013)

Financial innovation strategies will only be effective within a supportive enabling environment (Savoy 2022). While a complete overhaul of rural water constraints remains unlikely in the short-term, interim steps may consist of capacity building (enabling need identification) among small water suppliers, project implementation oversight, adequate maintenance and training, and ongoing technical assistance. The high startup costs of

water supply infrastructure become sunk if implementation goes awry, upkeep fails, or water supply or demand shifts unpredictably and the hardware cannot be repurposed for other needs. An increased focal shift toward maintenance of existing systems and adaptable modular or mobile water supply solutions may be required to service fluctuating rural water supply needs (e.g., van Kinderen and deVries 2021). Climate change adaptation offers a model of investing in “no-regrets” solutions, for which likely benefits will outweigh initial costs, regardless of which future water use scenario comes to fruition (Howard et al. 2016).

Serving populations equitably brings added challenges. Rural residents of low- and middle-income countries often lack even basic access to banking and lending services (Montgomery, Bartram, and Elimelech 2009). The households and organizations that participate in financial innovation tend to already be better off in terms of income, information access, level of education or training, stability, and/or performance. Where possible, using local financing institutions (i.e., local access to capital and savings) to support rural water supply may better allow for repayment leniency, nonmonetary collateral, and business development (Montgomery, Bartram, and Elimelech 2009). Ensuring WASH financial services benefit everyone will require creativity to work around varied sociopolitical contexts as well as targeted professional outreach and social engagement efforts. Communities of practitioners such as RWSN can play a key role in promoting dialogue.

LIMITATIONS

The information and examples provided herein are not systematic or exhaustive. Other rural water supply financial innovations exist, as described in more comprehensive catalogs (Deal, Furey, and Naughton 2021; OECD 2010). In-depth resources are referenced. Because financial innovation information is often proprietary and not formally documented in academic literature, the authors’ direct knowledge, presentations, and media coverage with varied reliability and timeliness offered key sources of information. The report primarily draws from resources published in English and focused on Africa, Asia, and Latin America.

CATALOG OF SERVICE PROVIDERS

TABLE 3. RURAL WATER FINANCIAL INNOVATION PROVIDERS

CATEGORY/SECTION	ORGANIZATION	WEBSITE
Village savings for water	Everflow Africa	https://everflowafrica.com
Village savings for water, Blended public/private finance	UDUMA	https://www.uduma.net
Village savings for water	Whave	https://www.whave.org
Village savings for water	Fundifix	https://fundifix.co.ke
Village savings for water	CARE International	https://www.care-international.org
Village savings for water	Catholic Relief Services	https://www.crs.org
Village savings for water, Performance-based funding	Plan International	https://plan-international.org
Village savings for water	Aga Khan Foundation	https://www.akdn.org/our-agencies/aga-khan-foundation
Village savings for water, Performance-based funding	Oxfam International	https://www.oxfam.org
Village savings for water	Freedom from Hunger	https://www.freedomfromhunger.org
Village savings for water	Water for People	https://www.waterforpeople.org
Village savings for water	Link to Progress	https://linktoprogress.org
Village savings for water	WE Consult	http://we-consult.info
Village savings for water	Lifewater International	https://lifewater.org
Village savings for water	Amref	https://amref.org
Village savings for water	Water and Sanitation for Development (WaSaDev)	https://wasadev.org
Village savings for water	SEND Sierra Leone	https://sendsierraleone.com
Village savings for water	The Water Trust	https://www.watertrust.org
Village savings for water	VSL Associates	https://www.vsla.net
Village savings for water	Tearfund	https://www.tearfund.org

Village savings for water, Digital financial services	World Vision	https://www.worldvision.org
Digital financial services	Grundfos	https://www.grundfos.com
Digital financial services	Safaricom, Kenya	https://www.safaricom.co.ke
Digital financial services	Safe Water Network	https://safewaternetwork.org
Digital financial services	Hangzhou Laison Technology Co., Ltd.	http://www.laisongroup.com
Village savings for water, Water quality assurance funds	The Aquaya Institute	https://aquaya.org
Performance-based funding, Blended public/private finance	The World Bank	https://www.worldbank.org
Performance-based funding	Global Partnership for Results-Based Approaches	https://www.gprba.org
Performance-based funding	Water Services Trust Fund of Kenya	https://waterfund.go.ke/rbf
Performance-based funding	UK Foreign, Commonwealth, and Development Office	https://www.gov.uk/government/organisations/foreign-commonwealth-development-office
Performance-based funding	SNV Netherlands	https://snv.org
Performance-based funding	Uptime	www.uptimewater.org
Performance-based funding	Thrive Networks/East Meets West	https://thrivenetworks.org
Performance-based funding, Standardized life-cycle costing	Bill and Melinda Gates Foundation	https://www.gatesfoundation.org
Performance-based funding	Australian Department of Foreign Affairs and Trade	https://www.dfat.gov.au
Performance-based funding	GRET	https://gret.org
Performance-based funding	iSEA Cambodia	https://iseacambodia.com
Performance-based funding	Bank for Investment and Development of Cambodia	https://www.bidc.com.kh
Performance-based funding, Development impact bonds	Stone Family Foundation	https://www.thesff.com

Performance-based funding, Development impact bonds, Blended public/private finance	USAID	https://www.usaid.gov
Development impact bonds	iDE	https://www.ideglobal.org
Development impact bonds, Blended public/private finance	Palladium	https://thepalladiumgroup.com
Standardized life-cycle costing	IRC	https://www.ircwash.org
Standardized life-cycle costing	Rural Water Supply Network	https://rural-water-supply.net
Blended public/private finance	Global Environment Facility	https://www.thegef.org
Blended public/private finance	African Development Bank	https://www.afdb.org
Blended public/private finance	Eranove	https://www.eranove.com
Blended public/private finance	Vergnet Hydro	https://www.vergnet-hydro.com

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