

The Opportunity of Leveraging Data from Private Sector Innovators for Improved Urban Water Services: The GSMA Experience

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Introduction

In low- and middle-income countries (LMICs), mobile connectivity and adoption has quickly outpaced access to water services. In this context, digital innovations are playing an increasingly pronounced role in water service delivery, with emerging evidence on their value related to the financial sustainability of utilities and decentralized water service providers.

New digitally enabled service modes — such as digital kiosks and pre-paid meters — offer many benefits to providers: they can ensure payment, reduce technical and commercial losses, and enable decentralized service providers to efficiently operate at greater scale. The digital tools underpinning these models, and other digital tools such as mobile applications and sensors, remotely collect vast amounts of data, and make it effective to analyze and share crucial information across multiple stakeholder groups. This can provide transparency and accountability when it comes to tracking the flow and consumption of water services, confirmation of payment, and supporting communication between service providers and customers. While numerous pilots have demonstrated this potential, this paper looks forward to how these data can be used in leveraging additional financing to the sector.

The GSMA Mobile for Development Foundation, with support from the UK Foreign, Commonwealth and Development Office, and others, has been supporting pilots to learn about digital water innovations through its Digital Utilities programme since 2012. Our broader programme mission is to support urban resilience in LMICs by enabling access to essential utility services through digital solutions. To date, the programme has awarded £9.4 million through 53 grants to organizations trialing and scaling digital tools for energy, water and sanitation services. This paper contains insights from our grants to digital water innovations in urban contexts, and the experience of these grantees in raising follow-on financing by leveraging the data their solutions generate.

The following section provides a brief context around the opportunity for digital urban water solutions, considering both the challenges in water services and opportunity provided by the mobile ecosystem. Section two summarizes the evidence generated from pilots across African and Asian countries. Finally, section three presents our views on the opportunity for the data from these innovations to unlock further financing, and we conclude by providing a view on the future of the sector.

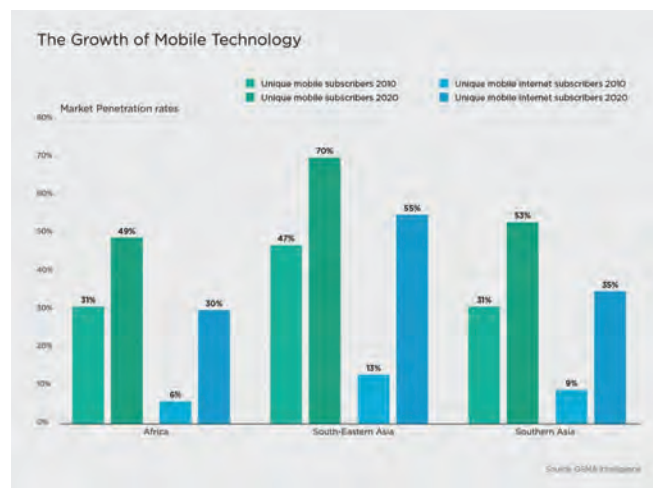
The scope of the paper reflects the GSMA experience of working with digital innovators. In some cases, these are business-to-business (B2B) technology providers working with water service providers and utilities. In others, the innovators provide water services directly to people through business-to-customer (B2C) models. Given most of these ‘companies’ position themselves as social enterprises, aiming to achieve financially sustainable business models, we consider their ability to raise patient capital in the form of equity and debt (akin to other start-ups). Although as discussed below, a significant amount of their funding to date still comes from grants. Additionally, in cases where government utilities are their clients, development financing institution (DFI) financing to utilities often plays an important role in the deployment of these solutions. The views in this paper are informed by discussions with our past grantees, supplemented by interviews with their existing, and potential, funders, as well as other organizations working as enablers of these solutions.¹

The landscape for digital water solutions

Water provision in urban areas of LMICs is under pressure from climate change and rapid urbanization unaccompanied by inclusive growth. Climate change is contributing to increasing water scarcity and increasingly frequent catastrophic weather events that damage infrastructure and pollute resources. Simultaneously, informal settlements are rapidly expanding across Africa and Asia, where 90 percent of global urban growth from now until 2050 will be concentrated. Urban water services already suffer from a lack of investment to maintain and expand services. The result is significant levels of non-revenue water, unreliable services, and large portions of populations that are not connected.²

In contrast, mobile connectivity and digital technology have expanded rapidly in emerging markets (see Figure 1). In Sub-Saharan Africa and Asia Pacific, the unique mobile connections now exceed 456 million and 2.8 billion, respectively, with an additional 500 million subscribers projected in each region by 2025.³

Figure 1
The growth of mobile subscribers and mobile internet



Building on this, mobile money provides access to financial services for many low-income populations in LMICs, for whom traditional banking is often inaccessible. The mobile money industry processes more than \$2 billion a day, and has more than doubled in value since 2017. The growth of mobile money accounts active on a 90-day basis has increased from 100 to 300 million in the last five years, with the regional growth depicted in Figure 2.

Figure 3 demonstrates that bill payments (which includes payments for utility services such as water bills) is a leading driver of this activity.

1 We'd like to thank the following individuals and organizations for their time and valuable insights: Minhaj Chowdhury, Drinkwell; Dan Kamiri, Wonderkid; Jim Chu, Untapped; Josses Mugabi, World Bank; Mark de Bois, Upande; Lauren Cuscuna, Safe Water Network; Galen Welsh, Jibu; Gregoire Landel, Citytaps, Edward Campbell-Gray, Longevity Development Holdings Limited

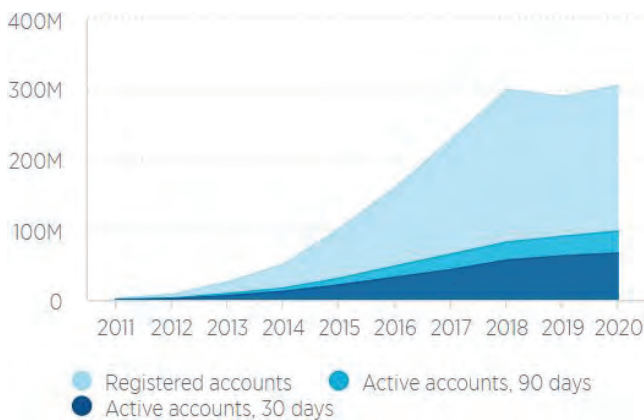
2 GSMA 2020. *Digital Solutions for the Urban Poor*.

3 GSMA Intelligence 2020, *Mobile Economy Report*.

Figure 2
Growth of mobile money accounts by region
East Asia and Pacific



South Asia



Sub-Saharan Africa



Source: <https://www.gsma.com/mobilemoneymetrics/#global>

Figure 3
Share of active accounts performing ecosystem transactions in Sub-Saharan Africa.



Source: GSMA State of the Industry Report on Mobile Money, 2021.

Mobile technology enables remote monitoring, communication, and digital payments, all of which are increasingly used as key tools in addressing water service delivery challenges. For example, digital sensors can be used to monitor networks and detect leakages in order to make services more reliable and hold utilities accountable to reducing water losses. Digital payments offer accountability and transparency for revenue collection through digital records. Digital payments can also bring convenience to customers by enabling them to pay remotely at any time. Combining digital payments with prepaid smart meters offer consumers greater cost control through small, regular payments, as opposed to unpredictable and large bills. Finally, for those unconnected to piped networks, digital dispensers at water points provide regulated pricing for consumers, and visibility on consumption for providers. As detailed in the following examples, there is increasing evidence that these digital tools yield operational efficiencies, revenue gains, and enhance the transparency needed to better manage network infrastructure. All of which are key ingredients for expanding and improving services, which should in-turn drive more investment in these tools.

The evidence we have for the value of digital tools and the data they generate

The GSMA has generated insights and evidence from our grants to pilot and scale digital utility services over the last eight years. From the 12 grants we've provided specifically to digital water solutions, we highlight key examples and evidence points for their demonstrated and potential value for delivering service improvements through the data they generate. These span both providers of technology to water utilities, and enterprises that take on responsibility for water services themselves.

The following subsections document examples from three prominent groups of solutions: i) digitally enabled community water points, ii) digital billing, payments and communication tools for utilities, iii) digital tools for network monitoring, and iv) smart prepaid meters.

Digital communal water points for unconnected households

A number of digital technologies convert manually operated standpipes to digitally controlled and remotely monitored dispensing systems – often referred to as water ATMs. These typically are paired with a digital credit system, where users pre-pay by topping up an account (which could be cash or digital) which is stored on the cloud. They use a radio-frequency identification (RFID) card or fob to connect to their digital account at the GSM or ethernet enabled water dispenser, and can select the desired amount of water to dispense. This technology can support both urban and rural populations. Some of these technologies are operated by a private company in partnership with a public water utility that sells the water, like GSMA grantee Drinkwell. Whereas some enterprises like Jibu, and GSMA grantee Safe Water Network, are licensed to sell water directly and work independently from water utilities. In both cases, digital tools have demonstrated significant operational efficiencies.

BOX 1

Drinkwell's work in Bangladesh

Drinkwell operates water ATMs in Dhaka and Chittagong, Bangladesh. In Dhaka, their water ATMs operate in sites where Dhaka WASA pumps had served as community collection points. Drinkwell stations treat the water as well, though Dhaka WASA gets paid for the water. The installation of more Drinkwell stations with water ATMs had the following impacts:

- **Expanded user base:** there was 10 percentage point reduction in non-registered Dhaka WASA line users who collected water from the WASA line (illegally tapped mostly), but did not pay for the water, and a five percentage point reduction in registered Dhaka WASA users as customers moved to the Drinkwell system.
- **Improved brand perception:** in a Drinkwell customer satisfaction survey, 90 per cent of users reported a more positive perception of WASA because of the Drinkwell ATM system.
- **Reduced wastage:** interestingly, in in-depth qualitative interviews with users, Drinkwell customers acknowledged a tendency to waste resources if they were received for free (which was the case with prior Dhaka WASA pumping sites). They reported that Drinkwell's service, where customers pay per use, has led them to be more accountable for the water they use and to reduce waste.

For more details and insights about Drinkwell, see our report [here](#).

BOX 2

Safe Water Network's work in Ghana

Safe Water Network (SWN) is a not-for-profit that funds the development of small water enterprises in Ghana and India. The model is based around the development of stations that purify and distribute the water. In Ghana, SWN currently provides water services to over 400,000 people daily. The GSMA provided a grant to Safe Water Network in 2015 to use mobile tools to replace pen and paper collection of data points from stations about their operations. The aims were to improve data integrity, reduce monitoring costs, and improve maintenance response times. In 2017, GSMA awarded SWN with a second grant to test digital water ATMs and pre-paid meters for household connections, both paired with mobile money payments. As a result of these grants:

- 96 per cent of those using the digital water ATMs reported they had better access to safe and affordable water since getting the card, and the same proportion reported they would recommend the service to a friend or relative.
- The collection efficiency dramatically improved, as did the non-revenue water (see Figure 4, which includes data for pre-paid meters to household connections that were also tested in the grant, though this technology is discussed later in the section).
- The majority of users did adopt mobile payments (as seen in Figure 5), which contributes to reduced losses.

Figure 4

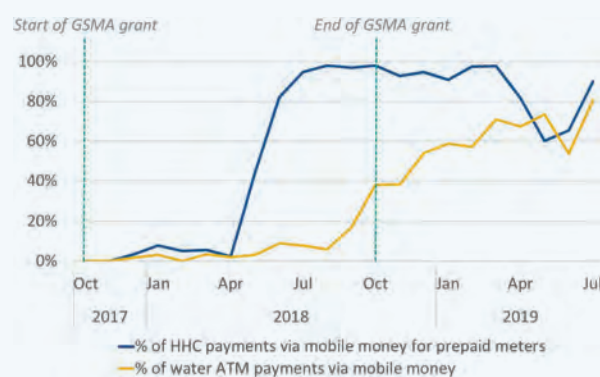
Safe Water Network Improvements with digitalisation on water ATMs and household connections.

		Before digitalisation	After digitalisation
Average revenue collection efficiency per month	Household connections	56%	100%
	Standpipes/ATMs	58%	86%
Average non-revenue water per month	Household connections	44%	0%
	Standpipes/ATMs	42%	14%
Average revenue collected per month (USD)	Household connections	147	156
	Standpipes/ATMs	308	255*

* Reduction in total revenue collected per month is as a result of there being a reduction in the overall volume of water consumed after digitalisation.

Figure 5

Safe Water Network customer adoption of mobile money payments for household connections (HHC) and water ATMs.



For more details and insights from Safe Water Network see our blog [here](#).

Digital billing, payments and communication tools for utilities

Increasingly, utilities are shifting to digital tools like SMS, IVR, mobile apps and mobile money, for their interactions with consumers, particularly for billing, payments and service issues. It's easy to see how these software tools can reduce commercial losses from pen and paper billing and cash-handling, as well as inefficiencies in the staff, time and other costs associated with manual billing, revenue collection and communication. GSMA worked with CGAP to carry out research on 25 water and sanitation providers (mix of urban utilities, small & decentralized providers) in which two-thirds were accepting digital payments. The findings included a reduced cost of cash collection by 57-95% (where this cost ranged from 3-20 percent of revenue collected). Providers who reported data showed that revenues increased from 15 to 37 percent driven by digital billing, mobile payments and in some cases a shift to prepaid models. These providers then used their cost savings and revenue growth to expand their businesses or lower the costs of their services.⁴

BOX 3

Wonderkid's work with Kenyan Utilities

Founded in 2007, Wonderkid is a software development company from Kenya that began working in the water sector in 2012 and received a grant from the GSMA in 2015 to scale these tools to four water utilities in Kenya. Wonderkid's solution is a suite of 13 customer- and utility-facing tools, including: MajiVoice, a mobile app for meter readers to record meter readings digitally, and a self-meter reading and payment system for users to send their own meter reading via SMS and pay via mobile money. Wonderkid also provides technical support for utilities to integrate mobile payments in their billing systems. Some of the key evidence of value from these tools is as follows:

- The Kilifi-Mariakani water utility is now 100 per cent cashless after adopting Wonderkid's services, with mobile money accounting for 60 per cent of all payments;
- In Isiolo (IWASCO), 800 customers a month were typically not home for their meter reading, which meant extra work and lost revenue for the utility. Now, customers can use the self-meter reading tool, which increased revenue collection for Isiolo Utility by 25 per cent between January and July 2020. Additionally, the meter reading cycle was reduced by three days, enabling meter readers to perform technical maintenance and revenue collection;
- At the end of the grant in 2017, KIWASCO Utility's complaint resolution time had dropped from over 15 days to around six days in 16 months;
- Non-revenue water at KIWASCO fell from 49 per cent to 37 per cent two years after digitalisation, and has dropped from 39 per cent to 30 per cent since the deployment of Wonderkid's service in 2018 (although these changes may be due to other factors as well).

Wonderkid's financing model is to be paid by utilities who should see revenue gains and cost savings from using their tools. And these same benefits should also make the utilities more investable to receive financing for capital expenditure. However, in practice, it's been a challenge. Wonderkid has shifted from seeking full upfront payment to offering a re-occurring Software as a Service (SaaS) model where utilities pre-pay. Making this transition has not been easy; while regulations in Kenya do allow utilities to take on loans, there are limited examples of this. Wonderkid themselves have relied on grants to develop and scale new tools, and 60 per cent of Wonderkid's utilities receive donor-funding to pay for Wonderkid's service, and 40 per cent pay for it themselves.

⁴ CGAP & GSMA 2019. Testing the Waters, Digital Payments for Water and Sanitation.

For more insights on Wonderkid’s work, see the full [case study](#) and our research on their [journey to scale](#).

Digital tools for network monitoring

Network monitoring solutions use digital sensors along a network to measure flows and detect leakages, thereby giving a utility the information needed to reduce technical losses. There are a number of large-scale technology companies that provided well developed monitoring tools, (i.e. SCADA systems), particularly in high-income countries and where there are powerful regulators, such as the UK. However in LMICs, these systems can be unaffordable for utilities, and there is often the need for a more bespoke technical approach to integrate with older software systems, or utilities are not independently regulated to reduce losses by using such tools.

The GSMA has supported a few organizations to develop more affordable or localized network monitoring tools, but these have faced challenges. In the case of such solutions, the business model is based on the utility directly paying organizations for their tools and accompanying services. However, there are usually significant upfront hardware costs for which there are few financing options. For pure network monitoring solutions, the utility must be committed to using the data to invest in repairs before any financial gains materialize, and this can slow down payments to the partner organization. This longer time horizon of these payments often stands in stark contrast to the short-term horizon of venture capital and impact investors, who expect quick returns.

BOX 4

NextDrop’s network monitoring in Bangalore

NextDrop was a GSMA grantee in 2013 working in Bangalore, that ultimately went out of business due to this challenge. The organization provided the water utility and customers with information about the timing of intermittent water supply to

different parts of the city. The system equipped valve-men with a smartphone app that tracked valve locations and turns when attached to valve keys, and automatically sent this information to the utility and an SMS to customers reached by that water main.

The tool was successful in that the data allowed the utility to smooth their supply to different parts of the city, and alerted consumers as to when water was coming so they did not have to wait. While it improved customer perception of the utility, it did not directly generate revenue for the utility, and NextDrop was not paid for the service.

BOX 5

Upanse’s Internet of Things (IoT) sensors in Kenya

Upanse, a GSMA grantee in 2015 in Kenya, developed an Internet of Things monitoring system that used sensors to ensure the flow rate of water to generate alerts related to leaks and bursts in order to help the utility reduce losses. While the initial roll-out during the grant faced technical challenges, as described [here](#), Upanse is now pairing this tool with a full ERP system that will support meter-reading, billing and payments. These data should give the water utility a digital ledger which they can use as evidence to receive a loan. Upanse is expecting to begin pilots of this tool (with both private and public water service providers) with banks involved to receive the data weekly to start to understand what would make the comfortable to lend to the utilities. Additionally, Upanse has also shifted from seeking post-payment from utilities to monthly pre-payment, through which systems will automatically shut-off in the case of non-payment.

Prepaid smart meters

Prepaid smart meters offer two key digital benefits. The real time monitoring of consumption gives utilities information to address leaks and forecast for improved resource management, while it gives consumers more visibility on their consumption to

control their spend. The prepaid modality means that customers need to be able to top-up remotely at any time, which is more suited to digital payments. For utilities this means digital payment records, and payments upfront, and for consumers this means they don't fear unpredictable and irregular bills.

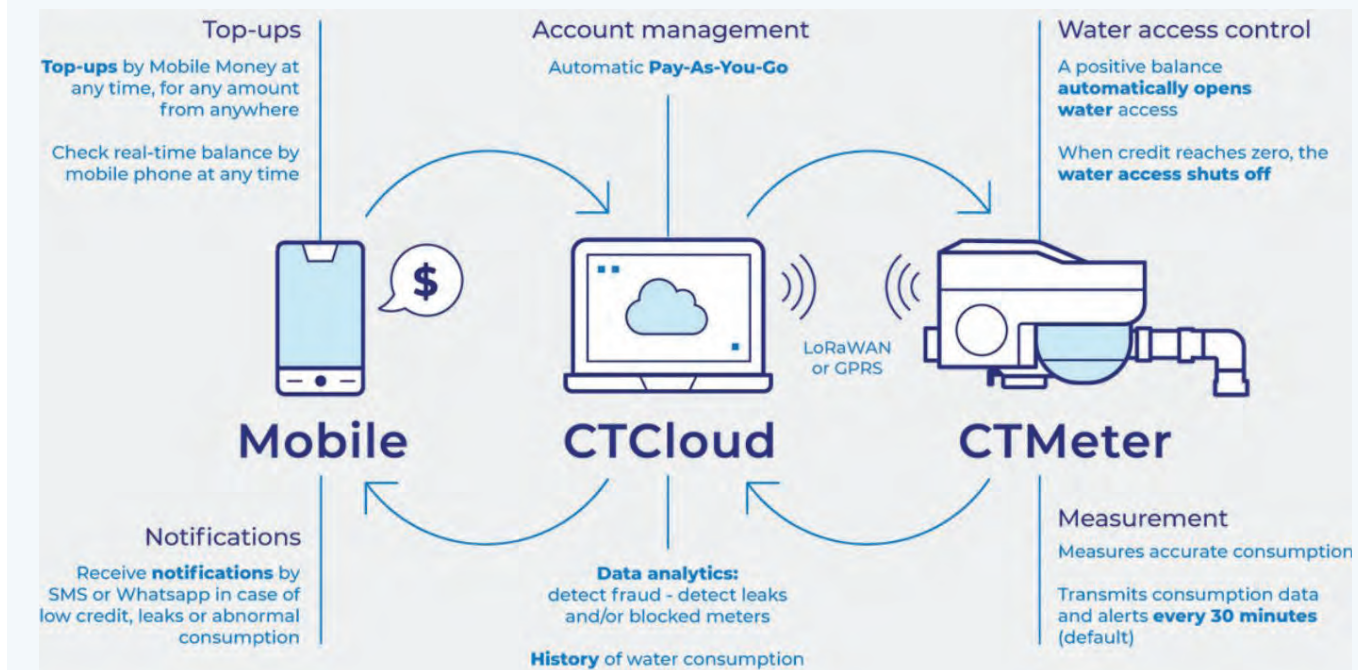
BOX 6

CityTap's prepaid water meters in Niger

CityTaps has developed a water utility subscriber management solution, CTSuite, which combines a smart, prepaid water meter (CTMeter) with an integrated software management system (CTCloud) to process pay-as-you-go (PAYG) payments through mobile money. GSMA provided them with an initial grant to develop the solution in 2015 and an additional grant in 2017 to scale the solution with the SEEN water utility in Niamey, Niger. The image below describes the solution.

Figure 6

CityTaps PAYG smart-water meter services



Source: <https://www.citytaps.org/for-water-utilities>

These digital tools have demonstrated the following impact:

- The PAYG mode made it possible to connect new, low-income households; these subscribers save up to 94 per cent per cubic meter of water consumed because the regulated SEEN water price is up to 16 times cheaper than water from pushcart vendors.

- Customers used to wait an average of nearly 1.5 hours a day to obtain water from alternative delivery services (pushcart vendors), but can now top up their water credit in just seven minutes on average, gaining 86 minutes every day.
- Before subscribing to CityTaps, 84 per cent of customers perceived their water consumption management as “not good” or “not good at all”, but approximately 82 per cent now perceive it as “good” or “excellent.”
- Since the water service is paid in advance, SEEN’s revenue collection exceeds 100 per cent for the part of the network on which the CityTaps solution has been deployed, and SEEN was paid 18 days in advance on average.
- In Malindi, Kenya, where CityTaps has expanded to provide the utility MWASCO with their solution, the utility has a 126% cash collection rate, and has seen an increase of 16.5 points of improvement in creditworthiness.⁵

CityTaps’ model requires upfront financing for the smart meters, with a reoccurring service fee for the platform. The challenge is that utilities are not able to pay for the costs of the hardware upfront. Yet the opportunity is that the pay-as-you-go (pre-paid) service to customers increases revenue collection, and provides digital records of payment, which can de-risk investment to cover the upfront costs of the smart meters. CityTaps is actively discussing this model with various financing partners, and their reflections on the opportunity are discussed in the following sections.

For more insights from CityTap’s work, see our blog and our research on their journey to scale.

Insights on the Value of Digital Tools and Data for Leveraging Financing

Our objective through the above pilots has been to generate evidence on the value of digital tools for improving service delivery and revenue collection, particularly focused on reaching low-income households. A key objective is developing financially sustainable solutions that can grow through revenue and or follow-on funding. Given the focus on financial sustainability, we’re particularly interested in the opportunity associated with crowding in commercial finance, such as concessional loans and patient equity. Yet, we recognise that innovative social enterprise models will continue to require grants, subsidies, and results-based financing in developing such models. Additionally, increased public funding in the water sector is a necessity given the tremendous challenges

the water sector will be facing over the coming decades. The annual investment needed to meet SDG 6 is \$114 billion from now until 2030, which, given fiscal constraints facing LMICs and donors, means that a range of different financial tools and sources are required to achieve SDG 6.⁶

While the evidence base is still developing, anecdotal evidence from our grantees, similar social enterprises, and their financiers, indicates that we are starting to see more investment in the digital tools that yield new data on water services. While we are optimistic about this trend, the use of data from these tools to secure more investment is still in an early stage. This reflects some broader challenges that are roughly related to: working with utilities and clients, being a small innovator, and the varying approaches and priorities of different funders or financiers. We explore these

5 City Taps Smart pay-as-you-go project in Malindi, Kenya (2020-2021). https://uploads.strikinglycdn.com/files/97f3948c-5a8e-4f4d-ad50-994c12ad6dfo/Project_report_Kenya_2021_final_English.pdf?id=3445363

6 OECD 2019. *Making Blended Finance Work for Water and Sanitation: Unlocking Commercial Finance for SDG 6*.

below, while also identifying some of the promising examples where data is unlocking finance for water services.

Our interest in these approaches is based, in part, on how digital tools for off-grid solar models have been, and are being used, for securing financing. Our programme supported some of the frontier pay-as-you-go solar (PAYG) home system providers at early stages in their development. These companies have now scaled to serve millions of low-income households, and raise significant investment. PAYG solar allows companies to offer customers solar home systems on a loan that is paid back in regular payments. Repayments are typically done via mobile money, and it is ensured through locking technology where the system is only activated (by a keypad code, or GSM communication) when paid for. These companies need significant debt to grow, and have raised this by ensuring investors of repayment through the mobile pre-payments, locking technology (and remote monitoring for larger systems). In some cases, sophisticated models of financing have decoupled the receivables financing so that it sits in a special purpose vehicle, or other entity, and ensures investors get repaid first.

The model has driven significant investment in the growth of asset-financing businesses to provide low-income households with income-generating assets, from PAYG solar irrigation and other agricultural assets, to motorcycles. Although financing of digital water solutions has many differences, as considered in the discussion below, it's useful to explore where the opportunity for this kind of financing — based on digital data and assurance of repayment — sits for the water sector. As we show later, funders such as Untapped are exploring asset financing models based on these assured digital repayments.

While not all of the digital water solutions we consider are comparable to this PAYG solar model, they do yield more data about services or help improve revenue recovery. Both of these are key ingredients to improving service delivery, and therefore potential drivers of financing to make water services more reliable, sustainable, and accessible to more people.

Financing challenges related to government utility providers

While plenty of pilots demonstrate the value that private sector, digital innovations can bring to utilities, getting these to scale has remained a challenge in many cases. Scale depends on utility revenue and commitment to pay for the on-going use of the tools, and financing for upfront hardware or software development costs. While innovators serving utility clients can try to raise capital independently, to do so they still need to demonstrate utilities are willing to pay for the services, and may be more likely to secure financing through utility partner financing from DFIs.

However, evidence of impact from pilots is not always available or sufficient to overcome some of the fundamental issues behind poor utility revenue collection and low creditworthiness in the first place. Therefore private sector innovators need to develop solutions, business models, and financing strategies that accommodate for these issues. We examine this in more depth in our recent paper, *Scaling Digital Solutions in the Water Sector: Lessons from CityTaps and Wonderkid*. Many of the challenges discussed in the report also impact the potential for financing, despite the additional data that comes from these tools. Below we discuss four areas that often hold back innovators from being able to work effectively with utilities.

- **Government utilities can move slowly in procurement decisions, and may not have the means to effectively appraise solutions.** This is a consistent barrier for the private sector innovators that work with them. Utilities are, rightly, often risk averse, and need to consider issues like technical vendor lock-in and system integrations. Behind this there is often technical information asymmetry between the utility and innovator. Moving from pilot to commercial agreement may require significant involvement from different government institutions. All of these extend the procurement, implementation, and payment cycles for these innovators, which can be deadly for those with limited cash runways.

Data that demonstrate the value from pilots can emerge slowly, and often after the 1-2 year funding window of pilots. Where evidence emerges slowly, or is not properly captured and disseminated by pilot funders, a gap is created in this reaching follow-on funders. The long lag time between successful pilots which demonstrate the value of digital tools, to when that data can be used to attract financing – either directly to the innovator, or from upstream DFIs funding utilities – needs to be considered from the outset and built into business models.

- **Many utilities struggle to collect revenues sufficient to cover their operating expenditure, and therefore have low-creditworthiness and limited funds available for investment.** In cases where revenue falls short, a vicious downward spiral results when reduced budget for operation and maintenance (O&M) makes services worse, and customers become unwilling to pay. These financial statements then do not support lending from local banks or DFIs. However, there is evidence that this can be overcome, see Box 7.

BOX 7

WASREB and the World Bank's work to improve utility creditworthiness

The regulator in Kenya (WASREB) and the World Bank have worked to assess and improve creditworthiness for water service providers in Kenya, and this has resulted in unlocking more utility financing. The approach consisted of providing technical assistance to strengthen business models, and a blend of grants and loans. With the IFC then appraising utilities for a debt financing facility, this led to loan offers from domestic banks and the establishment of more output-based aid facilities that have enabled Kenyan water providers to access US \$15 million of commercial financing, with further financing expected.

Poor revenue collection also inhibits utilities from making expected payments to technology vendors,

which the vendors would need not only to survive, but to raise more investment on their side. Several GSMA grantees have struggled to survive non-payment by utilities, and some have gone out of business, unable to adapt their business models. In particular, as highlighted earlier, those that have developed low-cost local network monitoring tools have struggled with this. Many have tried to shift their business models to operating on a prepaid basis with utilities, but this can be challenging to enforce, after months, or years, of utility non-payment.

Two key elements of successful B2B innovator models have been: i) starting with a prepaid service, and ii) a solution that delivers increased revenues for utilities immediately. This has been the case for companies like CityTaps, Drinkwell, and Wonderkid.

- **Utilities struggle to put together the business cases needed to justify investments in digital tools.** DFIs interviewed for this research point to a lack of data in helping them do this. This sees utilities stuck in a catch-22 situation: they do not have network monitoring tools in place to provide them with information about network performance, and this prevents them from articulating the business case for how investments will help them improve performance. This is particularly a challenge for tools such as network monitoring, as they do not directly increase revenues in the short-term.

Traditionally, both DFIs and utilities have focused funding on infrastructure, not digital tools that improve efficiency. A shift in focus on the efficiency is happening, but such large institutional shifts take time, and require adjusting financing objective. To support this shift, the World Bank is developing guidance to help utilities assess the value of digital tools (as well as other efficiency gains) that can help them improve their cash flows in the shortest amount of time. This should help utilities to evaluate technologies and move toward commercial agreements more quickly. The anticipated output from this in Kenya is to support utilities to use this and then develop bankable packages with them that local banks could finance.

- **Utilities must demonstrate political will to use data for addressing inefficiencies.** Political pressures can lead utility leaders to not embrace data that unveil losses. As a funder, we have struggled at times to report the impact that digital tools have had on improving services, because utility clients of our grantees are unwilling to share data for fear of making financial losses visible. In doing so, the opportunity to generate data that could be used to demonstrate improved efficiency and drive further investment is lost.

Additionally, for digital tools to achieve their full value, they need to be part of a suite of progressive changes and investments within utilities, and situated within a broader change process. For example, data derived from network monitoring tools only make technical losses along the network visible, but do not address their root causes. Further investment and time is needed for using the data to address losses. Similarly, in the case of adopting digital meter-reading tools, the cost savings come from re-deploying staff time to other areas of work, which can be politically sensitive. Yet high staffing ratios can be a big part of unbalanced utility cash flows in the first place. Digital innovators often find utilities willing to participate in grant funded pilots, but the real political will to make the changes necessary to support a strong business case for a full commercial roll-out, is often lacking.

Financing challenges related to private sector innovators

For private sector innovators that serve utility clients, there are also factors beyond just the utility operations that influence their ability to raise financing – even when supported by digital data. The water sector has some unique characteristics that need to be considered in financing, while at the same time there is fragmentation in priorities of the different financiers they might approach. Even for those innovators that also carry the role of water service providers, and therefore avoid some of the issues related to utility partners, it's important to understand how the nature of the water sector and the funding landscape impacts their ability to use

data for financing. However, as highlighted above, there are positive examples of where we do start to see data moving the needle on financing for these innovators. Below we consider some of the key aspects for innovators in approaching securing appropriate finance.

- **Different service models suit different financing strategies.** Firstly, digital water innovators have diverse views on what kind of financing is appropriate, depending on their business model, and their financiers to date. Jibu for example, has a more 'pure enterprise' model as an independent water service provider, and has been able to raise mostly equity, and some grants from patient capital funders working specifically in water. In contrast, Safe Water Network doesn't see equity as a strong fit because technically ownership of their water stations sits with the communities they serve. Additionally, they don't think water enterprise models scale fast enough to satisfy traditional start-up funders offering equity. Drinkwell has a revenue share model with some utilities and with others buys and then resells the water. The company takes a similar view on traditional equity, noting that currently there just aren't many examples of 'exits' for early-stage equity in digital water solutions in LMICs. Instead, Safe Water Network and Drinkwell see debt as an important tool for growth. Box 8 provides an example of how data from digital tools were central to SWN negotiating favourable loan terms.

Ultimately, the reality for many of the enterprises that provide water to low-income populations is that their margins for servicing loans are small. And this of course reflects the broader market challenges associated with water: the costs of providing a high-quality service are often not fully accounted for, and raising water tariffs directly is politically and socially difficult.

BOX 8

SWN's use of data from digital payments in re-negotiating loan terms

For Safe Water Network, grants from the GSMA which supported them with data on the reduction of non-revenue water by using water ATMs, were instrumental in helping them secure a loan in 2019. As discussed in their Spotlight on Loan Financing, this was a zero-interest loan, based on the insights from a previous loan in 2014, in which the terms needed to be reduced from 10 per cent to 2 per cent, and the term changed from 12 years, to no term, with quarterly debt payments made depending on income. Interestingly, part of the challenge Safe Water Networks faced in repaying the loan, was low-cost recovery at stations, which was later improved with the pre-paid smart meters and water ATMs as testing in GSMA grant. But part of the challenge was missing more rigorous financial data to set out the right loan terms.

- **Different funders and financiers have widely varying priorities, and these can pull innovators in different directions in an effort to collect and provide different data required.** The main challenge for enterprises using data to unlock finance is the different kinds of data, depending on the funder. Perhaps reflecting the legacy of charity funding, impact investors in the water sector still tend to focus on social returns far above financial returns. Yet for enterprises striving for sound financials, the extra costs of collecting impact data do not fit their business model. And robust impact data of water services, measured at the outcome-level, are notoriously difficult (and expensive) to obtain. Thus there's a strong call from enterprises for impact funders to pay for these data. Some also warned against results-based financing in water services if tied to impacts that are too costly, or too time-consuming, to measure.

Many innovators working on these solutions in LMICs begin their journeys with the help of grants. While there is an increasing shift away from a 'charity'

mindset among grant funders to a focus on more sustainable models, some enterprises continue to raise concerns about the impact of the charity mindset on their operations. Enterprises can find that grant funders want them to operate as financially sustainable enterprises in theory, but are displeased if they serve customer segments that are too 'wealthy.' A similar discourse exists in the PAYG solar space where companies have trouble pleasing both funders that want them to serve the poorest, and those that want them to be profitable. Another common frustration from enterprises is that grant money requires a lot of grant-writing resources, which an enterprise set up for market efficiency doesn't have. Other enterprises warn that grant funding can encourage them to develop unrealistic business models.

The frustration of enterprises at collecting impact data comes from their experience that for commercial agreements with utilities, and funders outside of the water impact space, for whom the most important data is expenditures vs revenues. This is the fundamental financial reporting for any financially sustainable operation. Digital tools that enable enterprises to share this kind of data are particularly valuable. They note that it's easier to get data on things like volume and sales (revenue), but much harder to automate digital data on expenses.

Digital tools play a key role in operational efficiencies needed to improve expenditure-to-revenue ratios, and this is another challenge that enterprises sometimes face with impact funders. Impact funders can see these tools as indirect to impact, when actually, these operational efficiencies are key to them being able to demonstrate financial gains, either for a broader pool of funders, or for utility partners.

- **Getting digital data takes time, particularly when behavior change needs to happen first.** Across our work with digital water innovators, we've found that to develop, implement, and gain sufficient adoption of digital tools always takes more time and resources than anticipated.

Financing challenges related to funders

Funders in the water sector face a set of challenges that help explain why the sector has not been able to attract significant commercial funding. A working group on blended finance in the water sector has analyzed OECD data on the amounts mobilized from the private sector by official development finance. A mere US \$2.1 billion have been mobilized in the water and sanitation sector from 2012-17, which represents only a 1.36% share of private finance mobilized into all sectors.⁷

When it comes to funding innovative social enterprises in particular, many large-scale funders such as development finance institutions (DFIs) lack a template for funding these innovations in the context of their larger loans to water utilities.

While many donors rightly focus on long-term developmental returns, commercial investors require higher, and often more short-term returns. While development finance can help de-risk investments in water and sanitation for commercial investors, the Working Group stresses that it *“cannot turn an excessively risky and/or a loss-making project/enterprise into an attractive opportunity for commercial finance.”*⁸

One impact investor in emerging markets, Untapped, has been exploring ways to overcome some of the funding model challenges for digital innovations in the water sector through smart asset financing linked to the digital payment trail associated with that underlying asset. Through their ‘Smart Asset Financing™’ platform, Untapped enables lending to businesses through connected assets, and using real-time data and digital payments to ensure repayment. For PAYG solutions that operate at scale, this could open up the opportunity to access commercial funding from more ‘traditional’ financiers, such as banks, via the platform.

Donors, and development finance institutions have a

range of different options when it comes to supporting social enterprises and digital innovators in the water sector, but despite some promising initial insights, the developmental returns and implications for commercial sustainability associated with these different options are still under-researched:

- **The role of public finance in providing early-stage patient capital for disruptive innovations:** As stressed by economist [Maria Mazzucato](#) and [others](#), disruptive innovations have required public funding at early stage before reaching the scale and maturity required to become commercially viable. Several high-risk technologies such as Artificial Intelligence (AI) or the Internet of Things (IoT) have the potential to add value to the sector, but use cases are still being piloted, particularly in low-income settings, and thus require public support.
- **The role of public and development finance in de-risking private investment:** By providing credit lines, guarantees, or by co-investing, development finance institutions can make commercial investments in water and sanitation more viable. The amount of commercial finance mobilized by blended finance for water and sanitation is limited compared to sectors such as energy or construction, but this could change as the sector works together to learn lessons in scale and financial sustainability. IW+, a new initiative by water service providers and donors, seeks to de-risk private investment by facilitating the replication of proven use cases through equipment leasing and digital payments.
- **The role of public finance in subsidizing access to those at the bottom of the pyramid:** According to a World Bank report, excluding China and India, global subsidies to the water and sanitation sector are estimated at around \$289-\$353 billion per year, or 0.5 per cent of these countries’ combined GDP. If only low- and middle-income economies are considered, that figure rises to between 1.5 and 2 per cent! And yet, across the 10 low- and

7 Working Group on Blended Finance for Water and Sanitation 2021. Outcome Document

8 Working Group on Blended Finance for Water and Sanitation 2021. Outcome Document

middle-income countries the report examined: 56 percent of subsidies benefit the top 20 percent of the population, while only six per cent of subsidies benefit the bottom 20 percent. Though shocking, it is not entirely surprising since subsidies are currently designed to benefit those that are already connected to formal piped water and sanitation services (i.e. the rich and upper middle classes). There is tremendous scope to find innovative ways to make subsidies in the sector more targeted and smarter, to ensure that they enable wider sector reform ambitions.⁹

- **The role of public finance in rewarding private service providers that are operating in last-mile contexts with performance-based subsidies:** Results-based financing instruments such as development impact bonds (also known as pay-for-success bonds), where repayment is contingent upon specified social outcomes being achieved, can play an important role in the water and sanitation sector. Small water and sanitation enterprises that use mobile technology are well placed to benefit from such financing as they are becoming increasingly sophisticated at digitally measuring social impact and operational data. Impact bonds could help donors meet their goal of extending access to safely managed services to low-income urban populations, while a range of digital tools can help target and prove impact.¹⁰ Meanwhile, *Uptime*, a consortium of researchers, donors, and rural water service providers, including our Digital Utilities Innovation Fund grantee, *Uduma*, recognises that while user payments for rural water services are an important contribution to operational cost-recovery, the full long-term costs of service provision cannot be achieved through local revenues alone in the near-term. To continue to improve financial and operational performance in 'last mile' contexts, Uptime seeks to provide real-time operational and impact data to attract results-based financing.

Ultimately, the water sector will require a combination of different financing instruments across different contexts, but it is critical for donors and national governments to continuously scrutinize established wisdom, and coordinate to maximize impact. From our perspective, providing the right financial support to innovative partnerships that exploit synergies between municipalities/centralized utilities and decentralized service providers, will prove particularly impactful and vital for achieving SDG 6. As a Digital Utilities programme, we're also really excited about how lessons on asset financing from other sectors such as off-grid solar are being adapted and applied to the water sector.

Conclusion

Our experience has demonstrated that digital innovators and social enterprises are already playing an important role in water service delivery across a range of LMICs. While the application of these innovations is becoming increasingly widespread in certain markets, there is still a significant evidence gap on a range of questions associated with these innovations and business models. Better evidence on the developmental returns of different business models and innovations, as well as the commercial sustainability of different models across different contexts is critical to gain a better understanding on the financial risk and potential commercial returns of different solutions. More importantly, this will provide the information required to build tailored funding models that respond to the unique challenges of the sector.

With our upcoming GSMA Innovation Fund for Digital Urban Services, we will aim to contribute to this learning agenda in the following ways:¹¹

9 GSMA 2021. *Smarter subsidies and digital innovation: Implications for utility services*

10 GSMA 2021. *Smarter subsidies and digital innovation: Implications for utility services*

11 GSMA 2021. *Supporting Innovation in Digital Urban Services*.

1. Testing business and partnership models for digital solutions to improve utility operations.

Given the challenges utilities face managing revenue and expenditure, more testing and evidence is required to strengthen the business models for providing digital tools. This includes tools that enable better customer relationships and enhance operational efficiency; smart metering and digital payment solutions that reach low-income customers and improve revenue collection; and large-scale deployments of digital monitoring tools.

2. Supporting the evolution of PAYG business models targeting unconnected low-income consumers.

There are a few established use cases in some contexts; however, innovation is still needed to develop business models and partnership models to reach scale. Digital kiosks and tap models are one example of these solutions, along with smart metering for household connections.

3. Supporting emerging and frontier digital solutions without well-established use cases to develop these. More testing is needed on emerging digital solutions where the use case or business models are still early-stage. For example, using unconventional datasets and big data to inform and plan service delivery, and the use of digital tools in regulating services and the informal sector.

When it comes to the future of financing of these solutions, similar to our conviction that partnerships between innovators and utilities, and social enterprises in utilities are critical to reach SDG 6, we also think that more partnerships between different type of funders (DFIs and grant providers) and financiers (impact investors, VCs, commercial banks) are essential to sustainably finance critical innovations in the sector.

Beyond this, institutional funders, both bilateral and multilateral, are well placed to make investments in the digital ecosystem in ways other players cannot. Longer term investments in the digital literacy of utilities, through capacity building and investment in developing data systems, are critical first steps in building an enabling environment in which digital innovations can thrive.

Stanford's Program on Water, Health and Development is working to improve the health and well-being of communities by creating the knowledge, skills and solutions needed to support effective management of water and wastes, and to ensure sustained, equitable access to water supply and sanitation services.

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Learn more at water.stanford.edu

