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BFA

The Potential of PAYGo for Achieving Water and Sanitation for All (SDG 6)





About FIBR

Launched in 2016, FIBR is an initiative of BFA in partnership with Mastercard Foundation to create new ways to connect low-income populations to financial services that meet their needs. Rapid uptake of smartphones in these markets means we can digitize data how individuals otherwise informally, transact as employees, customers or suppliers in their communities and with local businesses. The digitization of these trusted business relationships allows for new data that a broader range of providers can use to offer tailored financial products and services to this demographic. FIBR focuses on how technology can enable the generation of data insights to empower employers, employees and customers in the MSME and PAYGO sectors with financial services to achieve their goals.

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About Mastercard Foundation

The Mastercard Foundation works with visionary organizations to provide greater access to education, skills training and financial services for people living in poverty, primarily in Africa. As one of the largest private foundations, its work is guided by its mission to advance learning and promote financial inclusion to create an inclusive and equitable world. Based in Toronto, Canada, its independence was established by Mastercard International when the Foundation was created in 2006.

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About BFA

BFA is a global consulting firm specializing in using finance to create solutions for low-income people. Our approach is to seek out, create and implement financial solutions to help people manage challenges and seize opportunities. We partner with cutting-edge organizations that touch the lives of low-income consumers such as financial institutions, fintech companies and information providers. In creating solutions, we integrate our deep expertise in customer insights, business strategy, new technology and growth-enabling policy and regulation. Founded in 2006, BFA's clients include financial institutions, technology companies, donors, investors and policymakers. BFA has offices in Nairobi, Delhi, Boston, Medellín and New York. Innovating solutions for finance, for life.

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PAYGo Models to Achieve Clean Water for All

The Sustainable Development Goal (SDG 6) for clean water represents a step-change in thinking about water supply in low-income countries by dramatically expanding the public sector's commitment to providing safe water. Signatory countries are committed to providing safely managed drinking water as an ongoing service and agreed that safely managed drinking water must be on-premises, available when needed, and free of contamination. Health clinics and schools also need access to water services, illustrating the link between sustainable access to water and other development targets.

To achieve SDG 6, water service providers will need to innovate and adapt successful service models from other sectors. This thought piece explores how digital tools

(e.g., smart meters and mobile payments) developed as part of PAYGo solar in East Africa can be combined with new business models to scale in-home water connections in pursuit of SDG 6.

This paper considers PAYGo models and minigrids in the energy sector to identify opportunities to research and test their application to the water sector. The paper also describes the Safe Water Network, a US-based not-for-profit organization that is testing sustainable water service delivery models in both India and Ghana.

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Photo Credit: Arne Hoel / The World Bank (bottom), John Hogg / The World Bank (right)



SUSTAINABLE
DEVELOPMENT
GOAL 6

Clean Water and Sanitation for All

Why Aim for Financial Sustainability?

Extending water access faces two main financial challenges:

- First, providers must figure out how to finance last-mile connections to the water distribution system by extending the grid.
- Second, providers must find cost-effective models to serve low-income customers.

“The problem with water utilities is not that people don’t pay (although they don’t). Utilities take huge amounts of time to respond to demands for new connections, and they have a poor image with their customers. Why would people want to prepay? The problem is a human problem; purely technological solutions are insufficient. You need financial and cultural shifts to go with a new business model.”

- Régis Garandeau, Vitol Foundation

Without financing for on-site connections, universal access will either be impossible or astoundingly expensive for the provider. Second, if universal access is achieved without cost efficiency, providers will lose billions more dollars than they already lose now. Financial losses are not an idle concern: in one 2008 survey, more than half of African utilities were collecting revenue from less than half of their clients.

This paper focuses on solutions in which users pay for water. Governments have traditionally been willing to subsidize water providers that do not cover their own operational expenses. This is inherently unsustainable and may be unnecessary with financial innovations such as prepayment, digital payments, and consumer financing, as illustrated by progress in the energy sector.



“Keeping water tariffs low is one popular objective, but it is totally inconsistent with extending service coverage to the poor (unless a donor or government provides funds consistently over time). Thus, there is a need for a business plan that reflects reality.”

- Sanford Berg, Emeritus Professor of Economics, University of Florida

Innovation in the Energy Sector

The energy sector has struggled with the same challenges as the water sector; i.e. financing initial access and maintaining affordable provision. Although there are one billion people living without energy, it has been difficult for private companies to financially justify entering the sector. One review of 39 African countries found that less than half of the energy sectors were even covering their operating costs, and only two could be considered creditworthy.

However, new PAYGo service models, together with the dramatic drop in the cost of solar panels, are extending access at lower costs and may indicate a way forward for water providers as well.

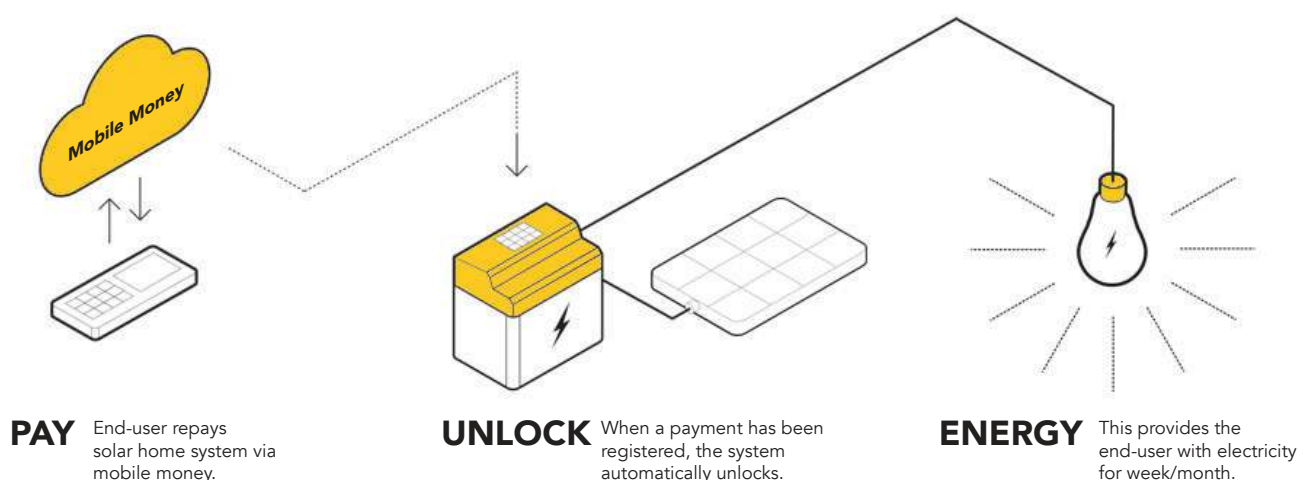
PAYGo Solar

PAYGo solar is a relatively new type of consumer financing that began in East Africa around 2011. With PAYGo financing, the service (energy) is linked to repaying a loan for the connection (in this case, a home solar system). The user pays an upfront deposit for a home solar system (15-20 percent of the cost) and signs a contract to

purchase a set amount of energy from the provider/financer, which eventually repays the loan for the system.

In PAYGo, the customer pays for the service as she uses it. For example, if the user buys 20 days of energy, she can use the system without interruption (battery and sun permitting) until her balance zeroes out, when her home system will automatically turn off. Once she sends in another payment, the unit reactivates and it continues this way until she has purchased the number of days specified in her loan contract, at which point she owns the unit and it unlocks permanently. In this way, PAYGo links the two challenges described above (initial connection and ongoing access), so that the customer pays for the connection as she pays for service, ensuring the financial viability of both.

There are several features that make PAYGo solar financing interesting relative to traditional financing models. First, there are no arrears. Like prepaid electricity, there are no deductions or fees for missed payments, ensuring that debt and non-repayment do not balloon. Second, there



is no compounding interest. Although a contract might nominally state that the user will purchase 365 energy days in one year, in reality it is just an agreement to purchase 365 energy days, full stop. Whether that takes 12 months or 14, the price the user pays is the same. There are often discounts for prepayment, but there is no financial penalty for delayed payment, although providers may repossess the unit after prolonged nonpayment.

Offering this kind of flexibility means that providers have no idea when they will be paid back for the original solar home system. But as more systems are disbursed and repaid and as credit operations become more sophisticated, it is possible to predict when and how different customer segments will repay. Once this is known, financial projections and portfolio management are possible, albeit in a non-traditional way.

PAYGo is often used interchangeably to describe both the prepaid service and the solar home system loan, because the two are tightly linked: the user feels they are purchasing a service, whereas the provider knows they are repaying a loan. Once the user has fulfilled their obligation to the provider, they can reasonably expect to use the solar home system for free for 2-5 years, depending on the size and quality of the system. While prepaid electricity has existed for several decades, the real innovation here is *linking financing of the connection to ongoing usage*.



Applying PAYGo to Water

Like the energy sector, water providers need a way to finance the connection of every household to piped water systems AND a service model that is capable of covering operating expenses and capital maintenance. While the PAYGo model provides promising ways forward for the service model, financing initial connections has been more difficult. Connections to the water grid have historically been provided by the state, so innovation in this arena has been slow. As such, PAYGo water services (ongoing use) are functioning and already beginning to scale, but PAYGo water financing (initial connection) remains largely untested. Whether PAYGo can also solve the complicated financing question remains unclear.

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PAYGo Financing for Water Services

PAYGo water services function using a combination of prepaid water services and digital payments. Prepaid water has existed since the late 1990s for community water services. Instead of reading water meters monthly - when large volumes of water can be (and are) lost to leakages - prepaid services allow the user to purchase

a set amount of water credit and then consume that water until the credit runs out. Prepaying gives users more control over their finances and water consumption, while demanding stronger accountability from their water provider. For the provider, prepayment reduces collection costs and eliminates arrears and disconnection/reconnection expense.

Combining automated prepaid systems and digital payments can lower costs further by eliminating cash management and operational costs. The GSMA, which has researched PAYGo water since 2012 and whose findings informed this brief, wrote in 2018 that “pay-as-you-go (PAYG) water...is helping to break down affordability barriers in the water sector, particularly in combination with mobile payments.” An IFC benchmarking exercise of African minigrid concluded that prepaid service linked to mobile money is “not only more cost-effective in terms of collections, but also substantially minimizes the risk of non-payment.” Together, digital payment and prepaid services create a low-touch, pro-poor utility service.

Despite the benefits, prepaid water has been slower to catch on than prepaid electricity. This may be due to the higher capital costs for prepaid meters and because of the debate about whether water should be considered a commodity or a basic human right. In the last five years, however, prepaid water services have grown in urban Africa (many of the following are based on GSMA case studies that can be found on the Mobile for Development Utilities website:

- In Kenya, Grundfos has been running its Lifelink water ATMs (prepaid communal taps paid for with smart cards - credit loaded via mobile wallet) for years.
- CityTaps has been working with the Nigerian water utility SEEN in Niamey to pilot LoRa-enabled smart meters linked to digital payments.
- The Lilongwe Water Board in Malawi worked with SeeSaw to install dozens of water ATMs on public standpipes.
- NWSC, Kampala's water utility, has been cashless since 2011, has worked with Water Forever to pilot PAYGo standpipes, and is investing significant resources in developing their own smart meters.
- Wonderkid has developed a mobile meter-reading solution that allows users to read a traditional postpaid meter on their own and pay their balance as often as they like. The solution might best be called post-paid-as-you-go.
- And Safe Water Network (SWN) has piloted prepaid household meters with a keypad/token solution in rural Ghana.

The technologies for prepaid metering, remote monitoring, and mobile money all exist but they are either too expensive

(meter), poorly integrated (mobile money, remote monitoring) or require significant investments to scale (all). But the vision is promising: if we can develop a water service model that is automated, digital, and low-cost, affordable, on-site water could become a reality for millions of people. But first providers need solutions for financing connections to get the water on-site in the first place.

PAYGo Financing for Water Connections

Household-level water services still rely on the user having a meter, which is an expensive piece of hardware (even more so if it is IoT-enabled) that requires costly installation. Although most households can afford the provider's usage fees, only the very richest can pay the upfront connection price (\$100-300) in cash. These upfront costs represent a significant barrier to access, one that must be overcome for prepaid and PAYGo models to scale.

The water sector has not seen the same level of innovation around financing for connections as it has for ongoing services. 'Social connection' programs are being used by many water service providers to overcome the upfront cost, but these programs are heavily dependent on subsidies. The following alternatives,

Photo Credit: Grundfos



including PAYGo financing for water connections, may be more financially sustainable.

Small water enterprises could borrow the **mass-market approach** favored by the minigrid sector by offering very low-cost (<\$10) connections to households that agree to purchase a minimum amount of water. Achieving widespread connections from the start of a project can generate volume and sufficient revenue to shift the payback curve enough to overcome the upfront capital expense, even without discrete financing for connections. This approach is also likely to cost less on a per-connection basis, as the provider can link up dozens of households at one time, as opposed to on an ad-hoc basis.

Organizations such as Water.org are offering **loans for connections** and have mainstreamed lending for water services among microfinance institutions. A provider could partner with a local microfinance institution (MFI) to help customers finance their connections upfront and allow them to repay the MFI separately.

Alternatively, the provider could offer customers financing for connections and **then combine debt service with water payments to create a 'PAYGo Water' financing experience**. The provider could increase the prepaid tariff to incorporate the loan servicing, or deduct the loan service charge daily from a customer's prepaid balance. This would link repayment to usage, and offer consumers more flexibility in repayment. CityTaps has used this approach to paying off arrears, and it could work to finance new connections.

In theory, these two options could also be combined: **a MFI could offer PAYGo water financing in partnership with the**

provider. In practice, as we have seen in the solar sector, PAYGo repayment may be too volatile for regulated financial institutions. This approach would require predictability from the provider, flexibility on the part of the MFI, and likely a third party to guarantee potential losses.

PAYGo financing offers several potential advantages for water connections: it links usage to repayment, simplifies the customer relationship, and provides the lender with a form of security (the lockout). However, it has its disadvantages as well, most notably that financing a discrete asset such as a solar home system is quite different from financing a connection to an ongoing service. Only experimentation and evaluation will tell us if PAYGo financing is the right direction for the water sector, or if more traditional microfinance and grid connection models are more appropriate. The answer may also vary based on the geography and the provider.

Implementing digital finance solutions in the water sector is a devilishly complex task. But it is one we should embrace.

Case Study

Safe Water Networks



Safe Water Network (SWN) operates in Ghana and India, providing peri-urban and rural populations with access to safe water at an affordable price. In Ghana, SWN works with communities to build and operate small water enterprises which consist of centralized pumping and purification stations that connect to a distribution system of public taps and private household connections (SWN's Indian model relies on franchising and will not be explored here). SWN expects to eventually transfer ownership of each small water enterprise (SWE) over to its local community, once they have demonstrated the operational and financial capacity to sustain the system.

As detailed in two blog posts published by CGAP ([here](#) and [here](#)), SWN's experiments with digital payments and prepaid meters have been a success, particularly from a business standpoint. Through prepaid meters SWN was able to eliminate arrears and double the effective tariffs collected. Despite a 27% drop in household consumption (likely a result of the accurate metering and closer monitoring of usage), revenue increased by 18%. Mobile payments will likely require a more sustained push and less of a local presence; many users were unfamiliar with mobile money and opted to keep paying the local manager in cash.

As SWN establishes new stations, it will begin to experiment with lighter staffing models and customer training on mobile wallets, relying more or less completely on mobile payments for its revenue. In order to do this, it will need an integrated back-

end system to receive mobile payments, generate the prepaid tokens that unlock smart meters, and communicate instantly with both user and meter. This is where FIBR comes in: we are partnering with SWN and mWater to help them develop just such a system, with the goal of low-cost, high-quality water enterprises clearly in our sights.

This solution helps the water service problem described above but still leaves the connection financing challenge. SWN would love to connect every household in every community but cannot bear that added cost without increasing its pricing. SWN has developed a partnership with Sinapi Aba, a Ghanaian savings and loan union, to test out microfinance loans for water connections. At the moment SWN would prefer not to have such loans sit on its balance sheet since they are a water provider, not a lender. What remains to be seen is whether loan repayments will be facilitated separately by Sinapi Aba, or if they could be paid together with the water tariff through one of the mechanisms described above.

Given the experience gained from the PAYGo sector, the latter approach will likely take some time to evaluate, as it will be difficult to initially determine the payback period on a \$100 loan. Yet as SWN collects more data from smart meters and can more accurately predict consumption, its modeling of PAYGo financing repayment will become more accurate, increasing the potential viability and scale.

Recommendations

Digital Finance Providers and Financial Institutions

Financial service providers (FSPs) may be surprised by the extent to which the water sector can further financial inclusion. Ambitious digital finance providers and financial institutions (FIs) can leverage high-frequency water interactions to offer customers tangible value and create long-term, mutually beneficial relationships. They should consider the following services:

- 1. Digital payments.** In many places, paying water bills is a pain. Customers are required to go to a banking hall or payment point and can only do so during business hours. Payment platforms have a chance to empower communities and embed their service in the rhythms of daily life. However, doing so will require new pricing models. Wherever possible, payment services should be free for users, with water providers assuming the cost of digital payments (at rates that are still lower than cash collection expenses). Water payments can offer a tangible use case for the uptake of digital payments and drive transaction volume among existing customers.
- 2. Financing connections.** As described in the previous section, a MFI may step in to help finance the cost of connecting households to a water distribution system. These loans are small in size but can be offered to multiple customers in phases, lowering acquisition costs. In addition, the use of innovative collateral (such as PAYGo technology in the meter) can shorten repayment periods and lower the probability of default. Once a customer has paid off a connection loan, it becomes much easier to offer them additional business or consumption loans.
- 3. Data analysis.** Water service providers, particularly those with a digital bent, possess hundreds of data points on their customers which can be used by FSPs to score clients. This would require sophisticated machine learning and several iterations, but is not unprecedented: FIBR worked with FINCA Uganda to help them score PAYGo solar clients, and evidence from the US indicates that utility data can be a powerful tool to financially include thin-file clients.

Photo Credit: Safe Water Network



Water Service Providers

To work towards this vision, water service providers also need to adapt their processes and approaches. They could start as follows:

- 1. Consider going cashless and develop a digitization strategy to link billing and payments.** Water providers can partner with payment platforms and software developers to integrate back-end platforms that will allow their customers to receive their bills, make payments, and lodge complaints digitally. Convenient, low-cost tools can be popular with customers, but may require activation campaigns and discounted rates to achieve rapid uptake.
- 2. Invest in data analytics and incorporate data analysis into customer service.** In order to provide a higher-quality service to more people, providers must invest in their own capacity to interpret and act on the growing amount of data that digital tools generate.
- 3. Experiment with service models that expand in-home access, including integrating financing with usage.** Software-as-a-service companies are making it easier to start and run a PAYGo business by providing ready-made asset and customer management tools. Many of those tools can be easily applied to the water sector, and would facilitate rapid integration with digital finance providers that have already linked up with PAYGo platforms. Conducting experiments with PAYGo water will help providers plan for the future, while supporting those experiments could be a catalytic use of donor funds. For providers considering this way forward,

it is critical to determine the right financing model. They should consider:

- *At what scale is the service provider selling water?* If it's community-wide with a mix of sales channels (Water ATM, sachets, household connections), what are the right criteria for determining appropriate customer-product match?
- *How will the offer be structured?* Will it be an offer of Loan + Service, with the option to pay the installation separately? Will loan instalments be regularly deducted from a client's prepaid balance? Or will loan and service be bundled (i.e., get water, in your home, for 25-50 percent more than you would pay at a communal tap)?
- *Whose balance sheet?* If financing is to be done through innovative mechanisms such as PAYGo, the provider may have to offer financing on its own, until it can establish enough of a track record for external investors. A sufficient record of success should unlock financing from local FIs, in either wholesale (finance the SWE) or retail (finance the end-customer) form.
- *How much control does the provider have over pricing?* For many large-scale utilities, changing tariffs may literally require legislative approval. In this case, bundling debt and water service will in effect be possible, and so regular deductions or separate payments may be better options.
- *What assets, if any, will the customer eventually own?* Customers have little use for meters but could

conceivably repurpose some pipes, taps, and small appliances that use water.

- *Can donors help defray the cost of connections?* Providing ongoing subsidies for inefficient providers may not be the best use of donor money. But offering results-based financing to incentivize connections could help defray the high initial expense and lower the financial burden of connection for households.
- *What opportunities exist for additional financing?* PAYGo water may offer more benefits than a one-off connection. Providers could also offer product financing for toilets, water tanks, or other products that might contribute to household water use and could be paid off in 1-2 years.



BFA PAYGo Publications

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Date	Title	Type
April 2019	Upcoming - A Tale of Two Sisters: Partnerships Between Microfinance Institutions and PAYGo Solar Companies (published with CGAP)	Report
Feb 2019	Machine Learning in PAYGo Solar: What You Need to Know Before You Jump in	Blog
Nov 2018	How Unbundling of the PAYGo Business Model is Driving Market Expansion	Webinar
	Rethinking Agents to Scale PAYGo Businesses	Blog
	Prosper: A Product Innovation to Link PAYGo Customers to MFIs	Blog
Aug 2018	Can PAYGo Unlock Access to Clean Water?	Blog
	Realities of Digitizing PAYGo Operations in an Unbundled World	Blog
July 2018	The Promise of "Unbundling" to Reshape PAYGo Solar	Blog
	Predicting Payment Behavior in PAYGo: Machine Learning Can Power Customer	Blog
	The Odd Couple: PAYGo Solar and Financial Service Providers	Blog

Recommended Reading

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2. Sharma, Akanksha. "Key trends in mobile enabled water services: What's working and what's next." GSMA. <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/08/Key-trends-in-mobile-enabled-water-services-What%E2%80%99s-working-and-what%E2%80%99s-next.pdf>
3. Nique, Michael and Kennedy Opala. 2014. "The Synergies between Mobile, Energy and Water Access: Africa." GSMA. https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2014/04/MECS_Synergies-between-Mobile-Energy-and-Water-Access_Africa.pdf
4. Waldron, Daniel, Caroline Frank, Akanksha Sharma, and Alexander Sotiriou. 2019. "Testing the Waters: Digital Payments for Water and Sanitation." CGAP & GSMA. <https://www.cgap.org/research/publication/testing-waters-digital-payments-water-and-sanitation>
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