Mobile for Development Utilities Annual Report

Intelligent Utilities for All



SANITATION WATER ENERGY

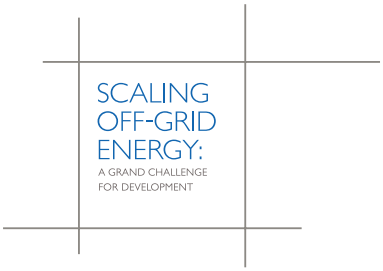
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The GSMA represents the interests of mobile operators worldwide, uniting more than 750 operators with over 350 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces the industry-leading MWC events held annually in Barcelona, Los Angeles and Shanghai, as well as the Mobile 360 Series of regional conferences.

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Scaling Off-Grid Energy (SOGE) Grand Challenge for Development is a global partnership founded by the U.S. Agency for International Development, Power Africa, the U.K. Department for International Development, the African Development Bank, and the independent charity, Shell Foundation. Our aligned partners include Acumen, GSMA, Microsoft, and the UN Foundation. By optimizing the collective resources and expertise of SOGE Partners, we are accelerating the growth of a dynamic, commercial off-grid energy market to provide clean, modern, and affordable energy access to the millions of households and businesses beyond the grid in sub-Saharan Africa.

Mobile for Development Utilities

The Mobile for Development Utilities programme improves access to basic energy, water and sanitation services in underserved communities using mobile technology and infrastructure. Our work encompasses any energy, water and sanitation service provided to a community, which includes a mobile component, whether it is voice, SMS, USSD, Machine-to-Machine, NFC, a mobile operator's agent network or tower infrastructure. We aim to seize the opportunity, leveraging mobile technology and infrastructure to enhance access to affordable and reliable energy, clean and safe water and sanitation services in underserved communities. The GSMA Mobile for Development Utilities programme receives support from the UK Government and Scaling Off-Grid Energy.

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Image courtesy M-KOPA Solar

Foreword

In emerging markets, close to one billion people live without electricity, 2.1 billion people lack access to safely managed water and 2.5 billion people do not have access to basic sanitation services. The GSMA Mobile for Development (M4D) Utilities programme has been working to leverage the power of the mobile industry to help bridge these gaps and achieve Sustainable Development Goals (SDGs) 6 and 7 for water, sanitation and energy for all. With the support of the UK Department for International Development (DFID) and the Scaling Off-Grid Energy Grand Challenge for Development (SOGE), the programme has been supporting partnerships between mobile operators and on- and off-grid utility service providers to unlock innovative new business models to deliver energy, water and sanitation to all.

Since 2013, the GSMA M4D Utilities Innovation Fund has supported 50 organisations with a total of £9.4 million in grant funding, benefitting over 2.7 million people directly through the grant activities and a further 27.5 million through the growth of these organisations. Collectively, these organisations have raised more than £223 million in follow-on funding after receiving support from the Fund. The most recent round of grants awarded in 2017 and 2018 were selected from our most competitive round to date with a total of 488 applications, demonstrating a growing appetite among mobile operators and partners to launch mobile-enabled utilities services.

The M4D Utilities programme has catalysed some of the most promising innovations for improving access to essential life services. Starting in 2013, the programme funded some of the first pay-as-you-go (PAYG) solar home system (SHS) companies — M-KOPA, Fenix, Mobisol and PEG — pioneers in what is now a fast-growing industry delivering energy to the underserved. Learnings from this experience have now been transferred to new verticals, such as water, irrigation, clean cooking gas and sanitation. We are thrilled to see many of these new business models gaining traction, particularly in the water sector. In 2018, the M4D Utilities programme funded start-up CityTaps, which raised $1.1 million from the GIF to scale its smart prepaid water metering solution in Niger, and received an order for 10,000 meters from the national water utility.

In this year's Annual Report, we are proud to present these trends through a complete review of the portfolio of organisations the programme has supported through its Innovation Fund. We are excited to see evidence that the mobile industry is recognising the primed business opportunity in the utility sector, and that this is leading to more mature and effective partnerships between mobile operators and service providers across the three sectors. Yet, globally, we still face profound challenges - urbanisation, climate change and economic inequality in particular - that disproportionately affect the poor who lack energy, water and sanitation services. By seeding the next generation of solutions, and supporting proven business models to scale, we believe the M4D Utilities programme will keep helping the mobile industry address these challenges.





Mats Granryd
Director General of the GSMA

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Infrographic 1

Programme Impact 2012 - 2018

£ 9.4 million AWARDED THROUGH

53 GRANTS

33 Energy

14 Water

6 Sanitation

£ 223.3 million

raised by our grantees in investment from the private sector following our innovation fund contribution

£ 214.4 million

£ 6.0 million

£ 2.9 million

FUNDED PROJECTS IN

28 countries

DIRECT PARTNERSHIPS WITH

40 mobile operators



BENEFICIARIES DIRECTLY IMPACTED THROUGH GRANTS:

2,761,607

BENEFICIARIES IMPACTED IN THE YEARS FOLLOWING THE GRANT THROUGH SCALING:

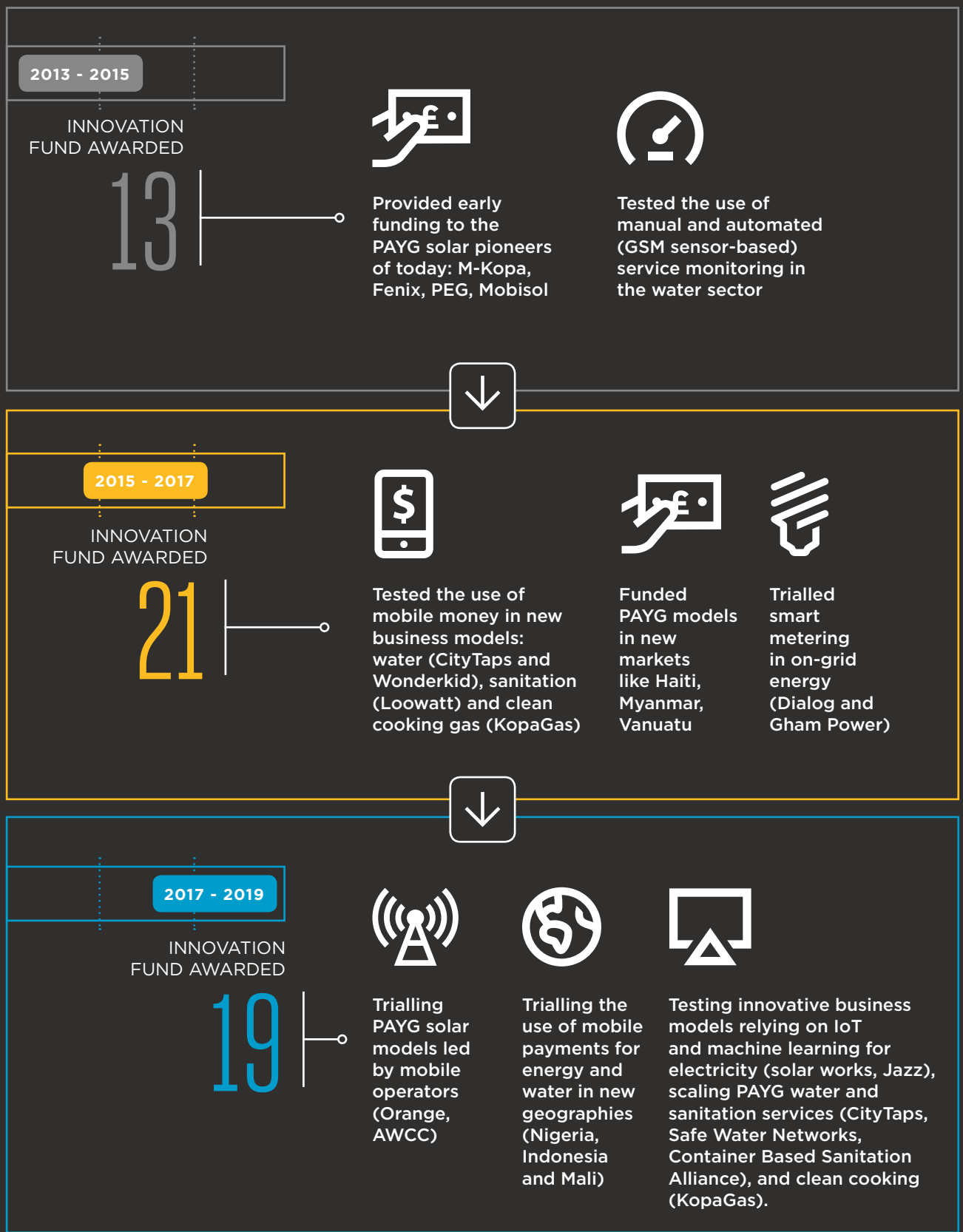
27,550,479*

We estimate that approximately 50 per cent of these are female.

* This includes a period of two years following the completion of the grant. A larger portion of these are attributed to the growth of Wonderkid, who serves 22 large utilities across Africa as of January 2019.

Infrographic 2

M4D Utilities - the journey so far



Infrographic 3

Mobile operator channels

How is mobile advancing SDG 6 and SDG 7?

MOBILE PAYMENTS

Mobile money

SMS payments

Mobile credit

Remote and secure payment collection

Digital record of payments

MACHINE-TO-MACHINE (M2M) CONNECTIVITY

Smart metering and monitoring of utility systems via GSM networks

On/off control of services to customers on PAYG arrangement

Improve lifetime and efficiency, trigger maintenance and provide insights into customer behaviour

MOBILE SERVICES

Voice

SMS

USSD

Apps

Report service delivery status

Optimise supply chains

Provide customer support

INFRASTRUCTURE

Telecom towers used as anchor loads for micro-grid and/or energy hub providing energy to surrounding communities.



SALES, DISTRIBUTION AND BRANDING

Leverage MNOs' extensive sales and distribution networks

Benefit from the MNOs' recognisable and trusted brand

CUSTOMER DATA

Creditworthiness assessments

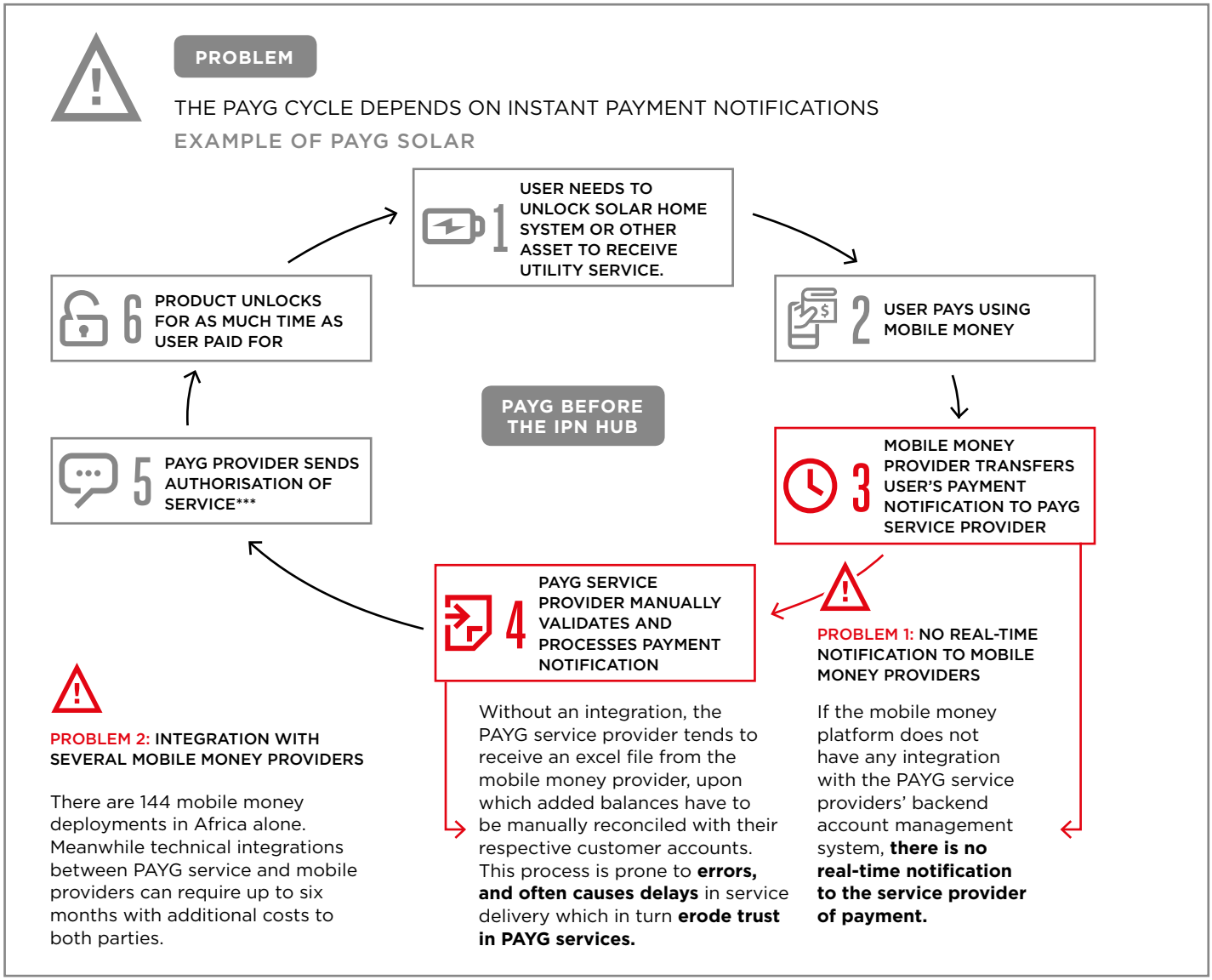
Perpetual payments

Rent-to-own models


HARGER
VOS
PORTABLES
À 100 SEULEMENT
MBO
MBO
Faites le plein d'éner
ICI
MTN
SNV

Infrographic 4

Scaling the GSMA Instant Payment Notification Hub to expand utility services



IMPACT

ENABLING RAPID EXPANSION OF THE PAYG UTILITY ECOSYSTEM

As of February 2019, the IPN HUB has processed notifications for over:

2 million unique payment transactions integrating with

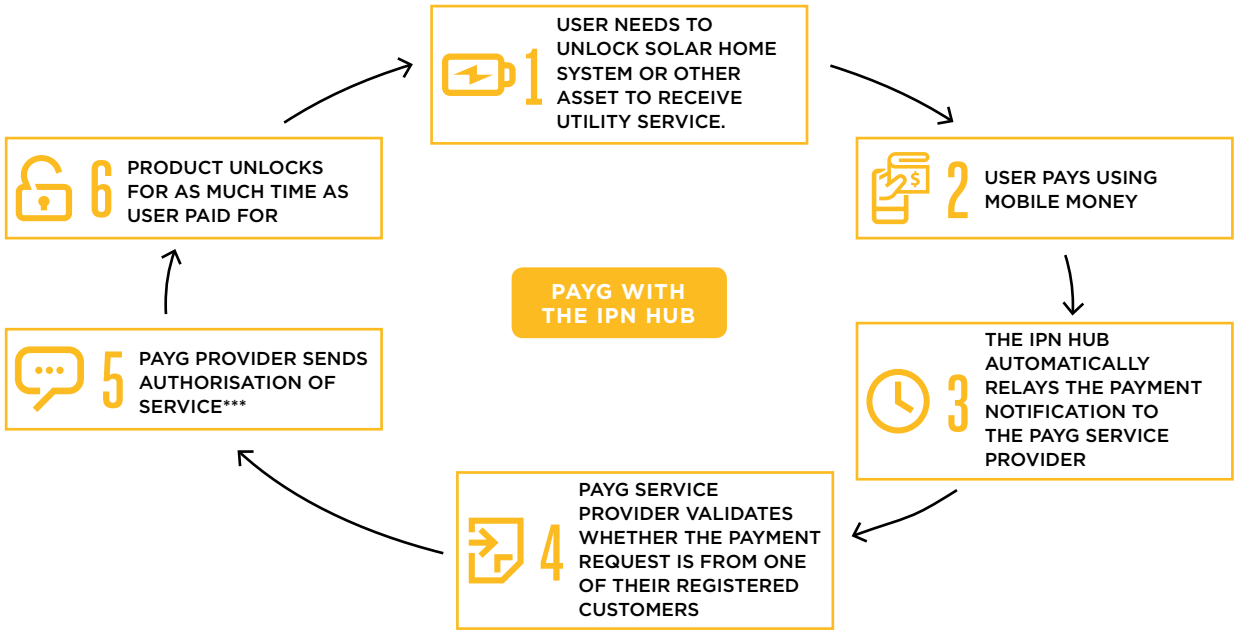
07 mobile money providers across

06 countries (with more planned in 2019).

SOLUTION

THE INSTANT PAYMENT NOTIFICATION HUB (IPN HUB)

EXAMPLE OF PAYG SOLAR



The IPN Hub, jointly developed by the GSMA Mobile Money and Mobile for Development Utilities programmes, provides a single point of integration between mobile money providers and PAYG utility service providers.

The hub enables PAYG providers to easily receive instant notification of customer payments from multiple mobile money providers, with whom they have commercial agreements.

Once a mobile money provider or service provider has integrated to the IPN hub, subsequent connections between partners are very simple.

> The IPN Hub has reduced the amount of time taken to supply energy to a customer from 2+ hours to 3 minutes.
>
> PAYG SOLAR PROVIDER, RWANDA

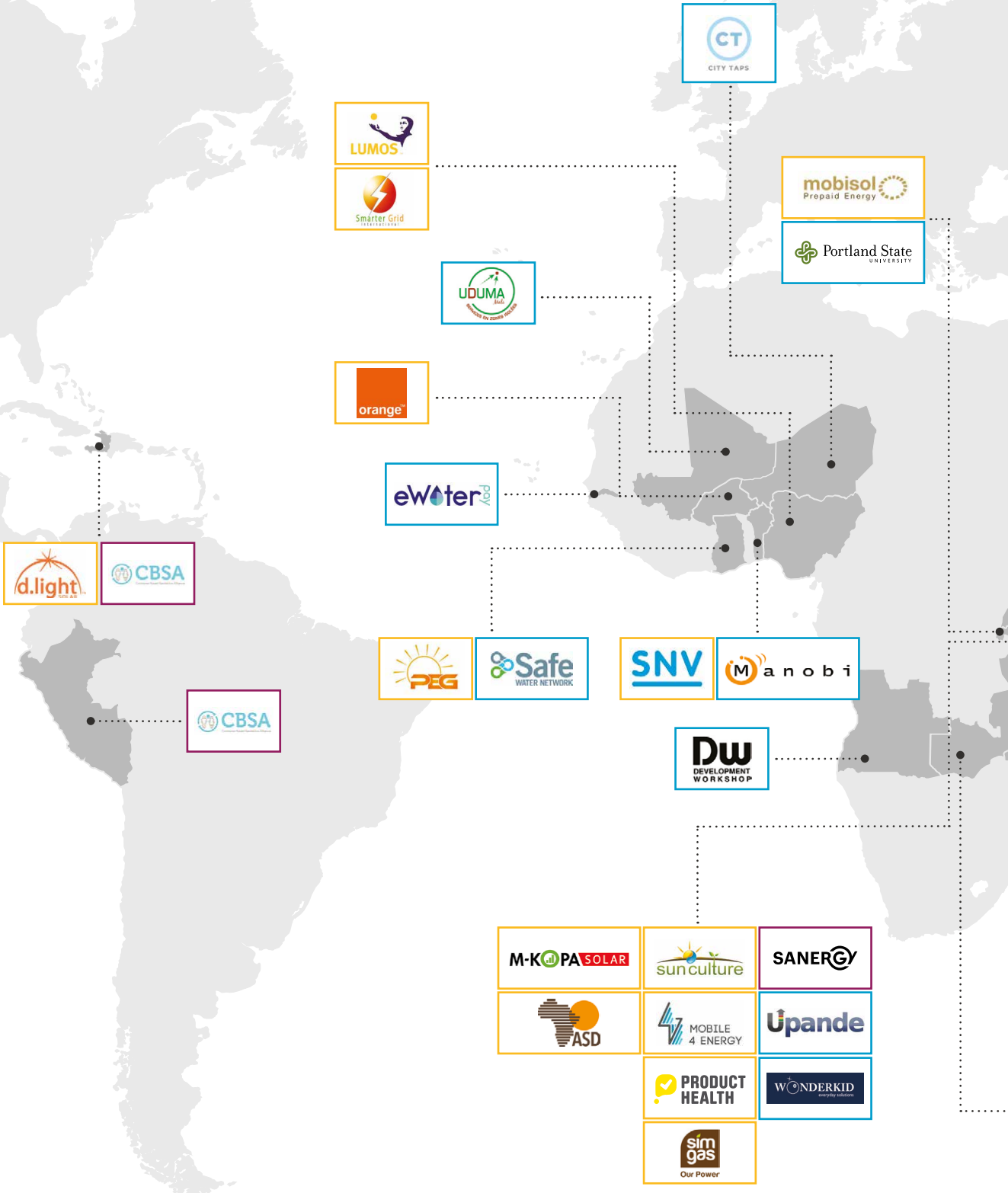
The IPN Hub has positively impacted the PAYG ecosystem and deepened synergies between PAYG service providers and mobile money providers in a variety of ways:

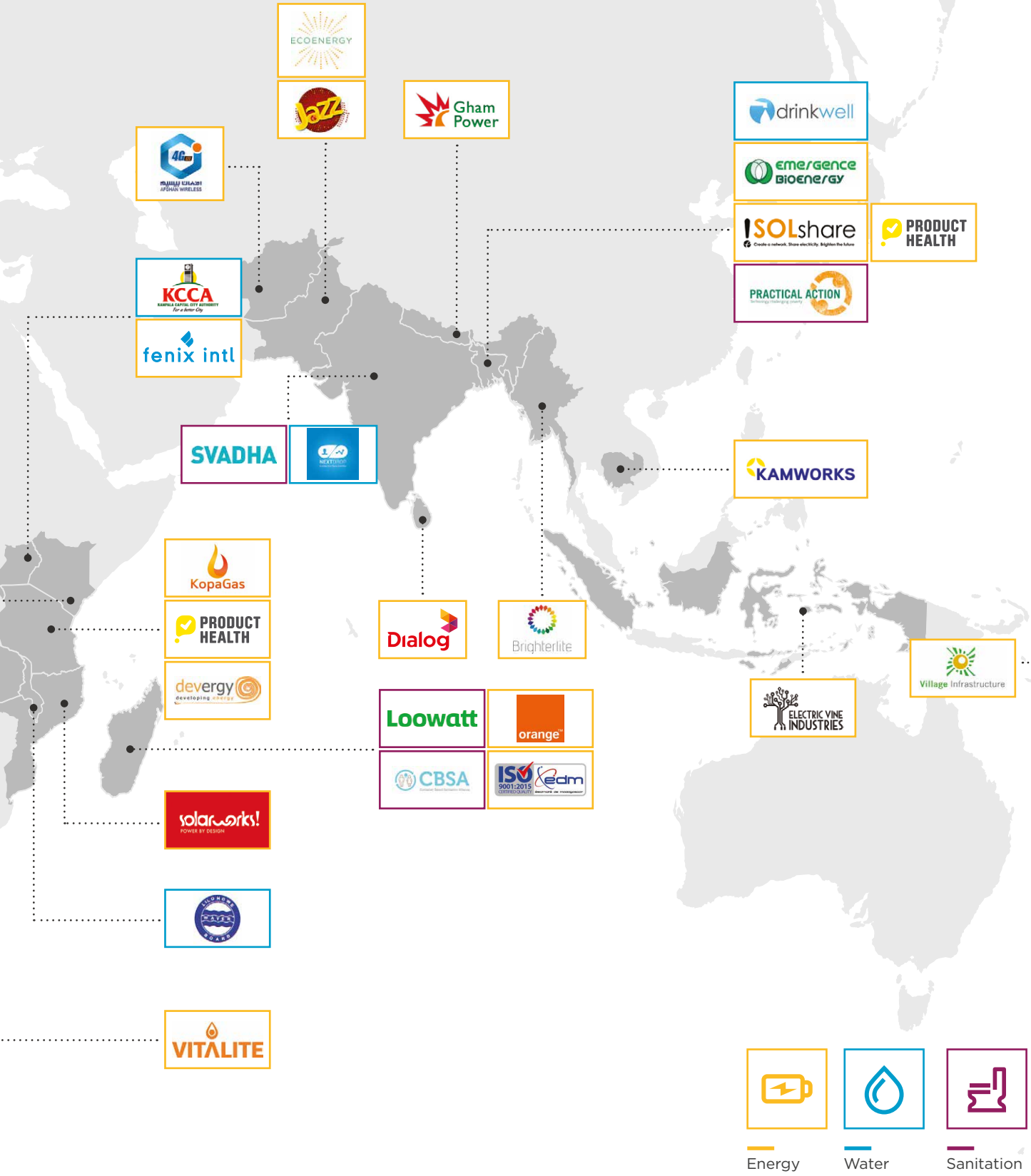
- **Better customer experience with PAYG service delivery models**
- **Clearer pathways and more opportunities to drive mobile money usage through a variety of PAYG use cases**
- **More administrative resources freed up to focus on scale and improved service delivery in the PAYG ecosystem**
- **Lower entry costs for small PAYG service providers**

***PAYG provider may send the customer an SMS with a code to enter into a keypad to turn on the service, OR if the hardware is equipped with machine-to-machine technology, the service provider can automatically send a signal to the unit to turn on the service without the need for customer interaction

Infrographic 5

GSMA M4D Utilities Innovation Fund grantees




ECOENERGY
Jazz
Gham Power
drinkwell
emergence BIOENERGY
SOLshare
PRODUCT HEALTH
PRACTICAL ACTION
KCCA
fenix intl
SVADHA
KAMWORKS
KopaGas
PRODUCT HEALTH
devergy
Dialog
Brighterlite
Village Infrastructure
ELECTRIC VINE INDUSTRIES
Loowatt
orange
CBSA
solarworks!
VITALITE
Energy
Water
Sanitation

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1. Tackling the sanitation challenge with mobile technology



Providing access to basic sanitation services remains one of the most complex and pressing global development and public health challenges. Worldwide, 2.5 billion people lack access to basic sanitation services[1] (almost half are forced to defecate in the open), while another two billion do not have access to safely managed sanitation services.[2] The unprecedented pace of urbanisation is compounding this challenge. Urban population growth, 90 per cent of which is concentrated in Asia and Sub-Saharan Africa, is dramatically outpacing gains in access to safe sanitation since most new urban residents are forced to live in sprawling informal urban settlements where the lack of sanitation services is especially acute.

Poor sanitation for some is a public health disaster for all

Rich and poor alike — and it has a profound effect on economic development. It is estimated that lack of access to sanitation has a global cost of approximately $260 billion every year, and diseases related to unsafe sanitation are responsible for six per cent of global deaths.[3] This is why sanitation is the focus of this year's M4D Utilities annual report, drawing attention to the need to support innovative sanitation solutions powered by mobile technology.

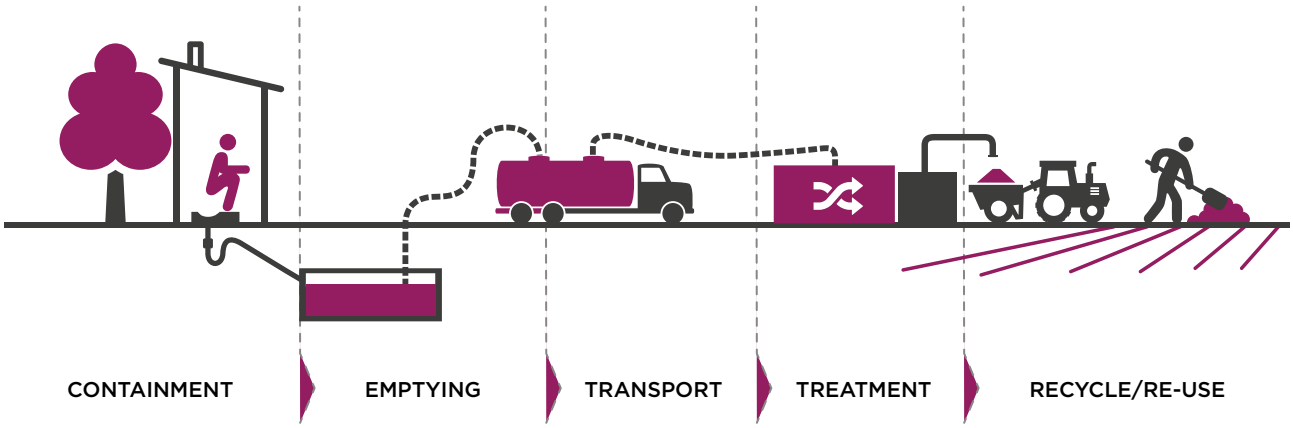
Mobile services (calls, SMS, mobile apps), mobile payments and machine-to-machine (M2M) connectivity can help to link disconnected parts of the sanitation value chain (e.g. containment and treatment), allowing services to be monitored remotely, reducing operational costs and connecting end users with service providers. Here, we outline the three main trends in mobile-enabled sanitation delivery:

Mobile enables the coordination of multi-stakeholder value chains, providing accountability and transparency

Resilient sanitation systems must go far beyond the provision of toilets. To allow different sanitation stakeholders to connect services along the sanitation value chain, various activities, such as pit emptying, waste collection, transport and recycling, must be monitored and coordinated effectively. GIS technology can be applied to geolocate sanitation infrastructure, trucks and routes through GPS-enabled phones. Smart tags/sensors can be used to track the use of facilities, improve fleet management and help provide accountable emptying/waste management services.

Figure 1 Source: Bill & Melinda Gates Foundation

Sanitation Value Chain



The solutions we have been funding as part of the GSMA M4D Utilities Innovation Fund provide evidence that mobile technology is increasingly regarded as a tool for optimising logistics and transport management. For instance, the Kampala Capital City Authority (KCCA), which received a grant from our programme in October 2017, aims to scale a mobile platform and geodatabase that connects pit-emptying entrepreneurs with customers and tracks service delivery across the sanitation value chain. This solution is particularly relevant in densely populated informal settlements where a significant proportion of the population is not connected to a sewerage network (in Kampala, 92 per cent of residents rely on non-sewered or on-site sanitation).[4] It enables KCCA to map the location of communal sanitation facilities, such as school toilets, while tracking and coordinating regular pit-emptying activities by private service providers.

As of November 2018, KCCA has mapped 171,268 sanitation facilities throughout Kampala.[5] Insights from its geodatabase and sanitation customer call centre have provided KCCA with actionable information, such as the characteristics of sanitation facilities, how frequently pits are emptied in different districts and the distances between pits and waste treatment plants. Given that 30 per cent of all pit latrines in Kampala's informal settlements are still emptied into the environment,[6] KCCA aims to use this information to target and guide investment planning, allocate resources and regulate service delivery and standards enforcement.

Practical Action Bangladesh is another GSMA M4D Utilities Innovation Fund grantee that is launching a mobile-based utility services platform for municipalities in partnership with a mobile operator, Robi Axiata Limited. Municipalities will use the platform to receive, track and fulfil requests from residents for water and sanitation-related utility services. Customers will pay contracted entrepreneurs via Robi Cash, Robi Axiata's mobile money solution, speeding up the delivery of services that might otherwise be delayed until payment is received.

Decentralised sanitation ventures are trialling mobile payments

Mobile payments can have several benefits for both sanitation service providers and customers. For service providers, these benefits include less cash handling, more efficient digital payment records and safe and timely transactions. In areas where desludging is carried out by private entrepreneurs, providing support for service providers to receive mobile money payments could open new opportunities for them to access mobile money savings and loan products.

GSMA M4D Utilities Innovation Fund grantees, Practical Action and KCCA, have both begun to trial mobile payments. KCCA is working closely with MTN Uganda to promote mobile money to professionalise pit-emptying businesses. For the end user, mobile payments provide a safe remote transaction method, while mobile wallets can allow them to save for vital sanitary purchases, such as desludging services. Loowatt's use of mobile payments (see case study) has inspired its partner organisation from the Container Based Sanitation Alliance (CBSA)-SOIL to trial mobile payments in Haiti.

2018 research into the role of mobile money in promoting access to sanitation services in Dakar suggests that mobile savings accounts can help incentivise people to regularly purchase desludging services.[7] It concluded that sanitation service providers should explore using mobile money saving technologies to market their services and become more competitive.



Mobile app-enabled platform models help low-margin business models scale

Mobile-enabled platforms can help municipalities identify gaps in public service delivery, while enabling partnerships with private entrepreneurs, donors and NGOs. Platforms can also provide a way to empower, train, formalise and professionalise sanitation entrepreneurs who often carry out activities critical to the effective provision of sanitation services, such as pit emptying, without any technical or material support.

Svadha, a GSMA M4D Utilities Innovation Fund grantee, is a sanitation ecosystem aggregator based in Odisha, India. Svadha aims to build better rural sanitation markets through aggregation of innovative, quality sanitation products and services delivered through a large network of entrepreneurs using information and communication technology (ICT). SaniMark, Svadha's mobile app, allows sanitation entrepreneurs to browse and choose from a range of affordable sanitation products, such as toilet bowls and pipes. Svadha also offers training to sanitation entrepreneurs to help them navigate the smartphone app and deliver value-added after-sales support services to its customers, such as toilet insurance or optional cleaning services.

Both Svadha and Practical Action (mentioned earlier) provide good examples of mobile as an enabler of B2B and B2G platform services. Mobile operators seeking to expand their mobile money ecosystems to less penetrated markets could benefit from driving uptake through these platforms, as pioneered by Robi Axiata and Practical Action's partnership in Bangladesh.

Mobile applications can also unlock revenue streams from circular economy approaches that seek to transform waste into value-added products, such as renewable energy or organic fertilisers. Led by Loowatt, a past recipient of the GSMA M4D Utilities Innovation Fund, new grantee CBSA is developing a mobile app and web-based platform to support its innovative waste-to-energy business model. The waste collected from Loowatt toilets is sent to an anaerobic digester where gases are extracted to generate electricity. Then, any drier, nutrient-rich materials are industrially composted to make fertiliser. Pioneering use cases that transform waste into a valuable investment asset can be critical to attracting private investment in the sanitation sector.



Case study 1

Loowatt: Three insights into the use of mobile payments in the sanitation sector

Loowatt is a start-up that designs and deploys waterless toilets that use a film liner to contain waste and odours. In May 2015, Loowatt received a grant from the GSMA M4D Utilities Innovation Fund to pilot mobile payments in the sanitation sector. It found that shifting from cash to digital decreased its costs by around 20 per cent overall, providing a very strong case to digitise payments in the sanitation sector. The pilot also generated some important insights for future mobile payment applications in the sanitation sector:

1. Mobile operator support is crucial to customer adoption of mobile payments for sanitation services: Airtel Madagascar's support and commitment to driving customer adoption of mobile payments proved critical, especially in the lead-up to mobile payment integration. Airtel Madagascar provided free cash-in and bill payment transactions, while also allowing Loowatt's customer service staff to become Airtel money agents, providing Airtel SIM cards where required and ensuring convenient cash-in services.

2. Mobile money adoption requires a constant push, starting with awareness building and continuing with customer support in the first few months of use: Many of Loowatt's customers were first-time mobile money users who encountered typical challenges, such as opening, validating and resetting an account, and feeling uncertain whether payments were recorded accurately. Loowatt addressed this by increasing customer support and providing discounts or rewards for payments made by mobile money to drive adoption.

3. Mobile payments can help decentralised sanitation ventures scale: The visibility into payment collection that mobile payments provide not only allows companies such as Loowatt to reduce their operating costs, but also provides interesting insights from transaction data (e.g. payment activity by gender). Most importantly, mobile payments allow decentralised sanitation ventures to reduce direct customer interaction, a key enabler of scaling social business ventures. As Loowatt expands, it aims to integrate Airtel Money transactions in its accounting system and dashboard, and partner with another mobile money provider to give customers more choice.

The use of mobile technology to improve sanitation services is still in a nascent stage, due to the lack of commercially viable alternative models for the underserved. We expect that our four newest Innovation Fund grants will reveal new business models in the sector, and generate insights into the use of mobile technology to optimise sanitation value chains and digitise payments for sanitation services.

SANITATION

LOOWATT

MOBILE-ENABLED LOGISTICS FOR WATERLESS TOILETS

LOCATION
Madagascar

MOBILE OPERATOR PARTNER
Airtel

USE OF MOBILE CHANNELS
Mobile App / Mobile Money

FIND OUT MORE
Loowatt: Digitising the container-based sanitation value chain in Madagascar

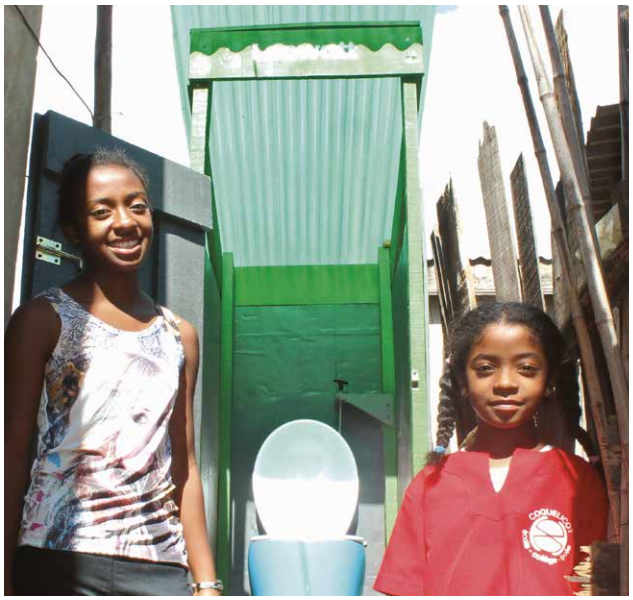
PROBLEM: Access to basic sanitation services is a major development and public health challenge in Madagascar where only 10 per cent of the population uses basic sanitation services.[8] Providing basic sanitation is particularly challenging in Madagascar's capital, Antananarivo, where high urban density poses significant challenges to waste and faecal sludge management.

SOLUTION: Loowatt has designed and deployed waterless toilets (for both public and household use) that use a film liner to contain waste and odours.

GRANT SUMMARY: In May 2015, Loowatt received a grant from the GSMA M4D Utilities Innovation Fund to develop a mobile app to track its waste collection processes, collect payments with mobile money and communicate better with its customers. In May 2018, Loowatt received a second grant from the Innovation Fund as part of the Container Based Sanitation Alliance (CBSA) to help expand and improve its mobile app and web-based platform to support the efficient delivery of household sanitation services.

IMPACT: The mobile app enabled Loowatt to support the service and maintenance of 100 waterless household toilets. The toilets benefitted female customers in particular, who account for 70 per cent of Loowatt's customer base. Collecting payments through mobile money instead of cash provided greater visibility into customer payment records and reduced operating costs by 15 to 25 per cent. As of August 2018, Loowatt's toilets have been used by over 100,000 customers and 200 tonnes of faecal sludge have been delivered to closed-loop treatment.[9]

LOOKING AHEAD: In November 2018, Loowatt announced a partnership with Laguna Water, a joint venture of Manila Water and the Laguna Provincial Government in the Philippines, to roll out the Laguna Portable Toilet Solution (PTS), a first-of-its-kind utility business model for providing non-sewered household toilets. Following a successful pilot, Loowatt will support scale-up of the Laguna PTS starting in 2019.



> I know exactly that the barrel went from the pit emptier, to this customer. I know as well that this customer still has some full barrels. [The pit emptier] will scan the QR code and bring them back to the site, then I will enter them in the system. I know specifically what load of work we have done today.
>
> FEEDBACK ON MOBILE APP BY TOJONIAINA ANDRIAMBOLOLONA, LOOWATT STAFF, MADAGASCAR

SANITATION

SANERGY

TESTING MOBILE SENSORS FOR MORE EFFICIENT WASTE COLLECTION

LOCATION
Kenya

USE OF MOBILE CHANNELS
M2M

FIND OUT MORE
Exploring the use of mobile-enabled sensors to optimise sanitation waste collection in Kenya

PROBLEM: Only 30 per cent of Kenya's population has access to basic sanitation services. Most Kenyan households are not connected to the sewerage system and require pit-emptying services. Sanitation services are particularly challenging in densely populated informal settlements like Kibera in Nairobi where the majority do not have household toilets and rely on public pay-per-use toilets.

SOLUTION: Sanergy designs, manufactures and sells low-cost, high-quality sanitation facilities called Fresh Life Toilets in Nairobi, Kenya. FLTs are owned and operated by Fresh Life Operators, residents of informal settlements who run them as a business or value-added service. As part of its franchise agreement, Sanergy provides training, ongoing marketing, business and maintenance support, and collection, transport and treatment services, thereby empowering Fresh Life Operators to provide clean and safe toilets to the residents of informal settlements.

GRANT SUMMARY: In May 2015, Sanergy received a grant from the GSMA M4D Utilities Innovation Fund to test how mobile-enabled sensors (provided by SweetSense Inc.) could optimise the waste collection process. These sensors would provide information on exactly when a toilet was full and needed to be serviced.

IMPACT: Sanergy tested different methods of using sensors to measure different indicators of toilet filling, ultimately settling on one that measured the number of users. However, Sanergy found that this data was not valuable for predicting emptying schedules given the cost of the sensors (including maintenance) and variables like day of the week, historical fill rates and location of the toilet. Sanergy found that the sensors could be useful for future planning in new areas, but not for regular route planning.

LOOKING AHEAD: As of May 2018, Sanergy has 1,800 Fresh Life Toilets in operation serving 60,000 people a day in 11 informal housing communities in Kenya. Sanergy's expansion throughout Nairobi has created 220 direct jobs (and a total of 1,250 direct and indirect jobs), while toilets were franchised to over 1,000 operators. By 2020, Sanergy aims to provide sanitation to 300,000 users and expand its operations to Zambia and Ghana.



> I prefer the sensor method [because] it saves time, cost and it is easier to monitor the toilet.
>
> FRESH LIFE OPERATOR, KENYA

SANITATION

SVADHA

A MOBILE PLATFORM TO CONNECT SANITATION MICROENTREPRENEURS WITH PRODUCT MANUFACTURERS

LOCATION
India

USE OF MOBILE CHANNELS
Mobile App

FIND OUT MORE
Svadha: Developing a digitally enabled sanitation ecosystem in Odisha, India

PROBLEM: In October 2014, the Prime Minister of India launched an ambitious national sanitation programme that aims to eliminate open defecation by 2019. The Swachh Bharat Mission (SBM) has received unprecedented political support and mobilised $25 billion from government, the private sector and civil society.[10] However, pit emptiers and sanitation entrepreneurs, who are critical to achieving the SBM's goals, often lack technical and material support.

SOLUTION: Svadha is a social enterprise in Odisha, a state in India, that builds better rural sanitation markets through aggregation of quality sanitation products and services. It has developed a mobile app to optimise the fragmented value chain between product manufacturers and microentrepreneurs who sell and install toilet products.

GRANT SUMMARY: In October 2017, Svadha received a grant from the GSMA M4D Utilities Innovation Fund to develop and launch SaniMark, a platform that integrates and enhances the sanitation ecosystem through e-commerce and provides customised, data-driven business support for entrepreneurs.

IMPACT: As of November 2018, 315 microentrepreneurs in the sanitation sector have signed up to Svadha's mobile app, 60 per cent of which are classified as active users.

LOOKING AHEAD: With a solid customer base in place, Svadha is now focusing on increasing app usage rather than downloads, as the true value of the solution will only be realised through increased business and transactions on the app. Svadha also recognised that a B2B app would not be complete without a link to the wider sanitation ecosystem, so is developing a customer-facing app that will allow customers to identify sanitation entrepreneurs in their area, while also providing access to masons and plumbers for installation and after-sales support. By 2020, Svadha aims to expand into other Indian states and explore partnerships in international markets to create a global virtual sanitation platform.



> Svadha helped me learn all of the technical aspects of sanitation and, with the help of credit, I started my own business — due to which I am completely financially strong now. Good quality material from Svadha also increased my demand and credibility among the community members.
>
> MR. GIRI,
> SVADHA ENTREPRENEUR, INDIA

SANITATION

KCCA

USING MOBILE TECHNOLOGY TO IMPROVE SANITATION SERVICE DELIVERY IN KAMPALA

LOCATION
Uganda

USE OF MOBILE CHANNELS
Mobile Services / Mobile Payment

PROBLEM

In Kampala, Uganda's capital, over 60% of the population lives in informal housing, while only 10% to 15% of the city is connected to formal sewerage.[11] In this context, pit latrines and septic tanks are often emptied haphazardly by independent pit emptiers who may dump waste illegally into the environment.

SOLUTION / PROJECT

Kampala Capital City Authority (KCCA) recently unveiled a sanitation strategy with a Geographic Information System (GIS) tracking system that allows customers to request services through a call centre that sources the jobs to independent pit emptiers. The pit emptiers use an app to record collection, transport and dumping at the treatment plants. In November 2017, KCCA received a grant from the GSMA M4D Utilities Innovation Fund to upgrade the pilot GIS tracking system, build capacity and promote pit emptying businesses. They are also working with MTN to promote mobile money as a tool for the pit emptiers to collect payments.

LOOKING AHEAD

As of November 2018, 45 pit emptiers have connected to KCCA's mobile app. 20 pit emptiers are also using MTN's mobile money service. 85% of pit emptier clients expressed a willingness to pay via mobile money.

CONTAINER BASED SANITATION ALLIANCE (CBSA)

USING MOBILE TO STREAMLINE THE DELIVERY OF HOUSEHOLD SANITATION SERVICES IN MULTIPLE COUNTRIES

LOCATION
Madagascar, Haiti, Kenya, Peru

USE OF MOBILE CHANNELS
Mobile Services

PROBLEM

A rising global population and rapidly growing urban areas are making it even more challenging to meet Sustainable Development Goal 6: Ensure availability and sustainable management of water and sanitation services for all.

SOLUTION / PROJECT

Since 2010, container-based sanitation (CBS) solutions have been emerging as a viable low-cost option for sanitation service delivery, particularly in low-income urban settlements where demand for sanitation services is high and on-site sanitation and sewerage are not feasible or cost effective. Founded in 2016, the **Container Based Sanitation Alliance (CBSA)** is a coalition that seeks to help CBS services reach scale and have a sustainable impact in urban areas around the world.

In May 2018, the CBSA received a grant from the GSMA M4D Utilities Innovation Fund to develop a mobile app and web-based platform to support the efficient delivery of household sanitation services in multiple countries.

LOOKING AHEAD

In November 2018, Loowatt, a CBSA member, announced a partnership with Laguna Water, a joint venture of Manila Water and the Laguna Provincial Government in the Philippines, to roll out the Laguna Portable Toilet Solution.

PRACTICAL ACTION

UTILITY SERVICES PLATFORM TO REQUEST MUNICIPAL SERVICES AND PAY USING MOBILE PHONES

LOCATION
Bangladesh

USE OF MOBILE CHANNELS
Mobile Services / Mobile Payment

PROBLEM

50%[12] of Bangladesh's population still does not have access to basic sanitation services. 80%[13] of Dhaka's rapidly growing population, around 12 million people, lack access to sewered toilets and must use on-site sanitation instead.

SOLUTION / PROJECT

Practical Action is a UK-based development NGO with operations in Latin America, East Africa, Southern Africa and South Asia. In these regions, Practical Action works with poor communities to develop appropriate technologies for renewable energy, food production, agro-processing, water, sanitation, small enterprise development, building and shelter, climate change adaptation and disaster risk reduction.

In October 2017, Practical Action received a grant from the GSMA M4D Utilities Innovation Fund to launch 1Service, a water and sanitation services platform through which customers can request and pay for services and give feedback.

LOOKING AHEAD

Once the 1Service platform successfully connects users to utility services, Practical Action aims to use the platform to help municipalities collect housing taxes. Depending on the success of 1Service in the three municipalities where the platform is being trialled, Practical Action may replicate the model in another 300 municipalities.

2. Ensuring a clean water supply for all through mobile technology



Globally, 844 million people lack even a basic drinking water service, while 2.1 billion lack access to safely managed water (i.e. drinking water that is available on premises, when needed and free of faecal and locally relevant chemical contaminants).[14] Through a variety of applications, such as mobile payments for water services, remote monitoring and operation of communal and household water points, as well as better interactions with customer service providers, mobile solutions are helping to improve the delivery and maintenance of water services.

Since 2013, the GSMA M4D Utilities Innovation Fund has awarded 14 grants to trial several business models in mobile-enabled water delivery. The following are three key trends we have observed through our support to water organisations over the last five years.

Pay-as-you-go water is picking up as mobile operators get more involved

Using mobile payments saves consumers time and money by providing a secure channel to pay for water at a fair and set price. For service providers, mobile payments enable regular revenue collection, reduce administrative costs (usually by eliminating cash management costs) and human error associated with traditional payment methods, and eliminate the risks of handling and keeping cash safe until it can be deposited in a bank.

There is increasing evidence that payments for water services are a promising use case for mobile money adoption and help to improve payment collection rates for both centralised and decentralised utilities. CityTaps, a GSMA M4D Utilities Innovation Fund grantee, has developed a smart water meter that allows subscribers to pay water via mobile money as they consume it (PAYG). In its pilot, CityTaps found that 72 per cent of users opened mobile money accounts for the first time after using its services. This promising solution is garnering interest from mobile operators and water utilities alike. Another Innovation Fund recipient operating in Africa, the start-up eWATERpay,[15] developed a digital PAYG water solution for communal water points that achieved a 100 per cent payment collection rate.

Although the slower adoption of mobile money outside East Africa and low digital literacy are two of the most pressing challenges in scaling this model, the growing involvement of mobile operators in PAYG water is positive development.



Case study 2

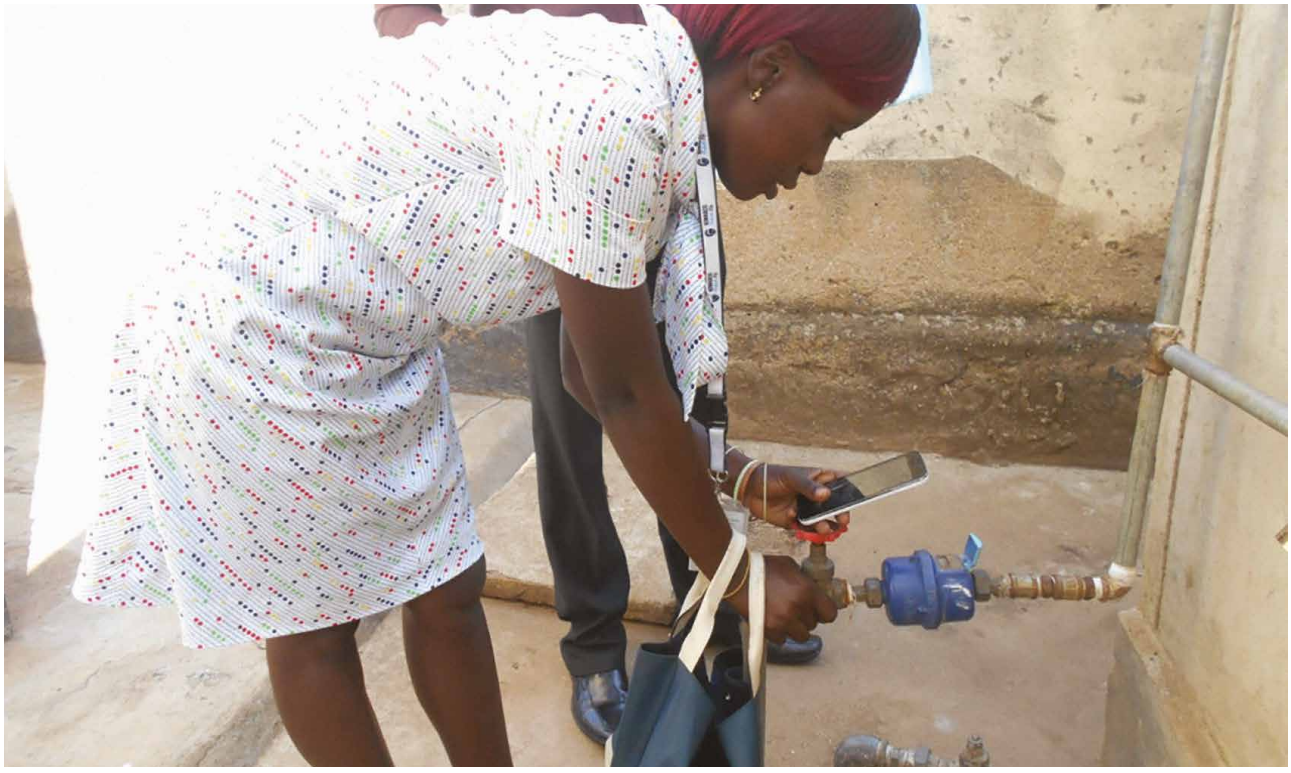
Mobile money usage with PAYG water systems: Grundfos kiosks in Kenya

Grundfos, a Danish water pump manufacturer, in partnership with World Vision, local communities and mobile operator Safaricom, has installed 32 self-service water kiosks, called Lifelink systems, in areas of Kenya where there is no water infrastructure to serve homes and businesses. The kiosk is an automated water distribution point integrated with a mobile money payment facility (Safaricom's M-Pesa) and real-time GSM monitoring of water dispensed and payments made.

The GSMA M4D Utilities programme recently conducted a field survey of seven Grundfos sites in Kenya and found that:

- In six of the seven locations surveyed, mobile money was the only mode of payment being used to purchase water at Grundfos sites.
- While mobile money usage had previously been limited to receiving and withdrawing money and buying airtime, users are now using the pay bill function for shopping and to pay school fees. In fact, Safaricom's data suggests that **35 per cent of all Kenyan Grundfos customers used the pay bill function for the first time when using Lifelink ATMs**, a sign of advanced mobile money use.

"Paying via mobile money is more convenient since you don't get to carry around cash. When you deposit money in your phone, it also limits your chances of misuse as compared to having it in cash." – LifeLink user, Kenya



Monitoring mobile-enabled water points demands a strong business case

Today a variety of mobile-enabled use cases are supporting the exchange of valuable real-time data to monitor and deliver water more efficiently, from the functionality of water delivery points to water consumption patterns, leaks, broken meters and regular or on-demand user feedback.

Water points can be monitored in the following ways:

- **Manual reporting to service providers by water service attendants or end users through mobile services (voice, SMS, apps):** GSMA M4D Utilities Innovation Fund grantee, Safe Water Network (SWN),[16] digitised operational data collection for peri-urban and rural small water enterprises by transitioning away from a paper-based manual system to a mobile app. The app collects water station data, such as sales, meter reading and water quality, and has reduced station monitoring costs (travel and accommodation to station locations) by 50 per cent and monthly downtime from 12 to eight hours per month.

- **Remote monitoring using M2M technology without human intervention at reporting stages:** One of the first GSMA M4D Utilities Innovation Fund water grantees, Portland State University (PSU), and its partners SweetSense Inc.[17] and Living Water International,[18] developed GSM-enabled sensors that send daily data on pump functionality (water pressure) to servers over GPRS networks. In the sanitation sector, GSMA M4D Utilities Innovation Fund grantee, Sanergy,[19] also used SweetSense sensors in its Fresh Life Toilets to estimate fill levels and schedule waste collection.

Figure 2 Souce: GSMA M4D Utilities

Mobile-monitored water delivery

Status monitoring (leakage, theft, device mal-function): Piped and Non-piped	**Quality monitoring reporting through user-operated testing kits/remote sensing**
NextDrop, Safe Water Networks, Manobi , Upande, Grundfos, EMS, Vergnet	Sarvajal, Grundfos, SWN

However, it is important to identify the business case for collecting monitoring data from the beginning. Ultimately, the water and sanitation monitoring pilots we have supported that did not have a clear way to finance the additional costs of mobile technology and service maintenance (by consumers or government) either did not continue or failed to scale. In contrast, GSMA M4D Utilities Innovation Fund grantee, Manobi, developed a digital management platform for small water providers in Benin that enables mobile payment for water, and profit and loss reporting, to help them become more investible. Manobi has since been awarded a contract by the government to scale its solution with small water providers across Benin.

A clear business case for mobile monitoring is particularly important in rural areas where service use tends to vary by season and payments are limited. The cost of investing in monitoring devices or staff can outweigh the perceived value and, even if this data is collected and stored in an actionable format, using it to drive investment can be tricky.

Paying more attention to the business case and financial sustainability of mobile monitoring solutions for water would also be good news for the mobile industry, as innovative payment models would be built into mobile-enabled water services.

Digitising utilities is helping to reduce non-revenue water and improve services

Water utilities often suffer from high rates of non-revenue water (NRW), which are usually caused by infrastructure problems, such as leaky pipes, or commercial issues, such as incorrect billing, faulty meters or illegal connections to the water network. For instance, water utilities in Kenya lose 30 to 85 per cent of revenues due to faulty infrastructure.[20] By failing to collect revenue for all the water they treat and distribute, utilities with high NRW rates cannot provide a sustained and reliable service for their customers as they lack the resources to fix problems. Extending the network also becomes more difficult, creating a vicious cycle of service decline.

Digitising processes such as meter reading, billing, payments and complaint management systems, has shown a clear reduction in NRW for many utilities. GSMA M4D Utilities Innovation Fund grantee, Wonderkid, has developed a suite of mobile tools for water utilities in Kenya to adapt and scale a complaint management, self-meter reading and payment system for users. The project saw a 28 per cent increase in revenue collection and an eight per cent increase in revenues billed for the utility.[21] The results were similar for CityTaps, whose digital meters, mobile payments and backend platforms have helped a water utility reconnect customers in arrears. This has increased revenue from low-income consumers and reduced the number of people connecting illegally, which has a negative impact on service delivery for all customers.

More partnerships are needed for PAYG to make a breakthrough in the water sector

While replicating the success of PAYG models beyond solar energy has been discussed for a while, it is finally beginning to show promise in the water sector and is particularly interesting for mobile operators serving urban households. Digitising utilities gives mobile operators the opportunity to drive mobile money adoption at scale.

For instance, Wonderkid's mobile solutions increased the number of mobile money transactions for bill payment at local water utility KIWASCO by 71 per cent and the value of transactions by 50 per cent. Mobile operators can also drive their businesses by offering bundled services to the utility, such as handsets, data, mobile money integration, bill management apps, USSD integration, SMS packs and short code.

WATER

WONDERKID

MOBILE-ENABLED CUSTOMER CARE AND BILLING FOR WATER UTILITIES

LOCATION
Kenya

MOBILE OPERATOR PARTNER
Safaricom

USE OF MOBILE CHANNELS
SMS / Mobile Apps / Mobile Money

FIND OUT MORE
Wonderkid Multimedia LTD.: Digitising water utilities in Kenya

PROBLEM: The National Development Plan of Kenya seeks to make basic water and sanitation available to all by 2030. Currently, just over 50 per cent[22] of Kenyans have access to improved water sources.[23] Kenyan water utilities lose 30 to 85 per cent of their revenues due to commercial or infrastructure problems.[24]

SOLUTION: Wonderkid offers software-as-a-service solutions, such as billing, customer management and revenue management, for public- and private-sector enterprises to gain real-time insights into their operations. In 2012, Wonderkid developed a customer complaint management system, MajiVoice, which received support from Kenya's Water Services Regulatory Board.

GRANT SUMMARY: In May 2015, the GSMA M4D Utilities Innovation Fund awarded a grant to Wonderkid to help it develop a suite of mobile tools for four water utilities in Kenya. The grant supported a complaint management and tracking system that allows customers to report maintenance and upkeep issues. It also offered a mobile app for meter readers that allows meters to be photographed, helping to address disputes and verify meter readers' activities in real time. A self-meter reading and payment system allows users to send their own meter reading via SMS and receive a preliminary bill with instructions for paying via mobile money using Safaricom's M-Pesa.

IMPACT: KIWASCO, one of four utilities supported by the project, recorded a 28 per cent increase in revenue collected and an eight per cent increase in revenue billed. The average complaint resolution time dropped from more than 15 days to six days. During the project, the number of mobile money transactions to pay water bills increased by 71 per cent and there was a 50 per cent increase in the value of transactions.

LOOKING AHEAD: Using the tools developed and improved during the project, as of December 2018, Wonderkid is serving over 22 water utilities across Africa, providing services that are accessible to over four million customers using mobile platforms.



> Previously, logbooks were used and a lot of documentation and filing [was done; these were then] dispatched to different offices [and field zones]. It was quite a process compared to now — complaints are logged first on the computer then passed on to the right person for action [via computer or mobile phone], which is fast and direct.
>
> KIWASCO CUSTOMER CARE STAFF,
> KISUMU, KENYA

WATER

CITYTAPS

SMART PREPAID WATER METERS FOR URBAN HOUSEHOLDS

LOCATION
Niger

MOBILE OPERATOR PARTNER
Orange Niger

USE OF MOBILE CHANNELS
Mobile Money / M2M Connectivity (LoRa)

FIND OUT MORE
Bringing water to every urban home with the power of mobile: An update on our grantee, CityTaps

PROBLEM: Water supply disconnections due to non-payment is a common issue for urban residents of Niamey, Niger.[25] Meanwhile, Niger's national water utility faces challenges serving the poor with affordable and clean running water, while also reducing the physical and commercial losses it needs to remain financially sustainable.

SOLUTION: CityTaps has developed a water utility subscriber management solution that includes a smart prepaid water meter that uses Orange mobile money and M2M technologies. The solution allows households to make micro-prepayments for their water at any time using mobile money. CityTaps also provides a software management system and a subscriber management dashboard to monitor usage and performance of the meters remotely.

GRANT SUMMARY: In September 2015, the GSMA M4D Utilities Innovation Fund awarded CityTaps a grant to launch 250 smart prepaid water meters in Niamey, Niger, in partnership with the local water utility, Société d'Exploitation des Eaux du Niger (SEEN) and Orange Niger. In April 2018, CityTaps received another GSMA grant to continue scaling this service.

IMPACT: As of October 2018, CityTaps has installed 460 of its CTMeters. An initial survey revealed that 62 per cent of CityTaps customers are first-time mobile money users, and 88 per cent of surveyed users felt that their water spending had decreased since the project began. Ninety per cent of women using the service felt that they spent less time obtaining water.

LOOKING AHEAD: Building on the project funded by the GSMA M4D Utilities Innovation Fund, CityTaps plans to reach 200,000 people by the end of 2019 and more than two million by the end of 2022. The company has also been selected to participate in the OrangeFab France program, which will provide support to integrate and deploy its solution in other Orange-footprint countries, such as Senegal and Côte d'Ivoire. In October 2018, CityTaps raised one million euros and has received an order for 10,000 meters from SEEN to scale its service.[26]



> I can do what I want with my money, because I don't need to wait until the end of the month to know how much I need to pay for water.
>
> CITYTAPS USER, NIGER

WATER

SAFE WATER NETWORK

IMPROVING WATER DELIVERY THROUGH MOBILE MONEY AND M2M TECHNOLOGIES

LOCATION
Ghana

MOBILE OPERATOR PARTNER
MTN Ghana

USE OF MOBILE CHANNELS
Mobile Apps / Mobile Money / M2M Connectivity

FIND OUT MORE
Reducing water station operational costs through mobile monitoring

PROBLEM: Nearly 18 per cent of the population in Ghana relies on an unprotected well/spring or surface water to meet their daily needs. An additional 17 per cent has access to an improved water source, but the supply is extremely limited.[27]

SOLUTION: Safe Water Network (SWN) builds and owns water treatment and distribution stations and has worked alongside communities in Ghana since 2009 to provide training and support to ensure the stations can be locally managed and operated.

GRANT SUMMARY: In September 2015, SWN received a grant from the GSMA M4D Utilities Innovation Fund to develop an app to digitise its manual water station data reporting systems for 37 water stations. In May 2018, SWN received another grant from our Innovation Fund to trial mobile money services and M2M connectivity for water ATMs and prepaid household meters in partnership with MTN Ghana.

IMPACT: The 2015 project reduced station monitoring costs by 50 per cent and helped to reduce maintenance response time per station by four hours per month. SWN has converted over 100 households in two communities from postpaid meters and cash-only transactions to prepaid meters with the option to use mobile money instead of cash.

LOOKING AHEAD: The current mobile monitoring tool captures financial and operational metrics, but development is underway to track consumer parameters, which builds on the current system. This additional functionality will allow SWN to measure how volume purchased is affected by customer demographics and seasonality, and how customer activation campaigns affect household participation.



> We are now at the forefront of technology; hence ways of reporting issues have greatly improved. I don't need to travel for miles just for collection of data.
>
> SWN STAFF,
> GHANA

WATER

DRINKWELL

MOBILE-ENABLED WATER ATMS TO PROVIDE CLEAN WATER TO LOW-INCOME HOUSEHOLDS IN DHAKA

LOCATION
Bangladesh

MOBILE OPERATOR PARTNER
Robi Axiata

USE OF MOBILE CHANNELS
Mobile Apps / Mobile Money / M2M

PROBLEM: 41 per cent of all improved water sources in Bangladesh are contaminated with E. coli bacteria, which suggests a high prevalence of faecal contamination. About 13 per cent of the country's water sources also contain arsenic levels above Bangladesh's legal limit.[28]

SOLUTION: Drinkwell, a US-based company with subsidiaries in India and Bangladesh, has developed a sensor-based water treatment solution for purifying water and distributing it through water ATMs.

GRANT SUMMARY: In October 2017, the GSMA M4D Utilities Innovation Fund awarded a grant to Drinkwell, in partnership with Dhaka Water Supply & Sewerage Authority (DWASA) and mobile operator Robi Axiata, to operate water ATMs in Dhaka fitted with remote monitoring technology to ensure a safe and reliable water supply.

IMPACT: 96 per cent of Drinkwell customers at six water ATMs found their current water supply extremely or mostly safe and clean. As of December 2018, Drinkwell has installed over 80 M2M-enabled water treatment and distribution points. It has so far delivered over one million litres of water to over 200 systems across India, Bangladesh, Laos, Cambodia and Nepal, giving over 250,000 people safe water by partnering with organisations including WaterAid, USAID, Dhaka Ahsania Mission, GIZ, DWASA, India's Department of Science & Technology and Tata Trusts.

LOOKING AHEAD: In addition to Bangladesh, Drinkwell also operates in India, Nepal, Laos and Cambodia. Drinkwell is now preparing to test mobile payments, which would no longer require ATM caretakers to transfer funds to the DWASA. In May 2018, Drinkwell secured a contract with the DWASA to expand its services to 300 water ATMS in Dhaka, and another contract from the Water Supply & Sewerage Authority to pilot three water ATMs in Chittagong, Bangladesh. Drinkwell's vision is to reach five million people by 2020 and one billion by 2030 by expanding to markets in China and Africa.



> Drinkwell is good even if you have to pay for it, because the water is good.
>
> DRINKWELL USER, DHAKA

WATER

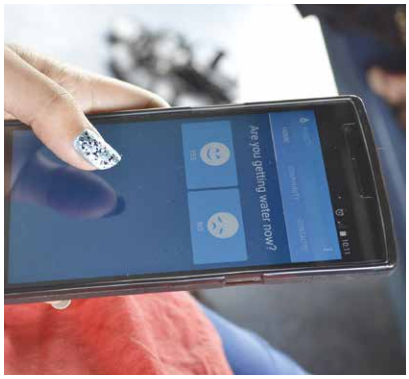
NEXTDROP

USING MOBILE PHONES TO OPTIMISE REAL-TIME WATER DELIVERY INFORMATION

LOCATION
Bangalore, India

USE OF MOBILE CHANNELS
SMS / Mobile App

FIND OUT MORE
NextDrop: Water.Simplified



PROBLEM: Due to scarcity, water distribution in Bangalore is managed by about 400 "valvemen" who manually turn on and off 8,000 valves around the city. This creates delays and has a significant impact on end users as the process and information flows are not conducted in real time.

SOLUTION: The NextDrop solution bridged this gap by gathering information from valvemen and giving consumers 30 to 60 minutes notice of when their water would be turned on, helping consumers to manage their daily routines. Most importantly, NextDrop provided near real-time visibility into ground-level information to Bangalore Water Supply and Sewerage Board (BWSSB), leading to data-driven decisions that should result in better service.

GRANT SUMMARY: In January 2014, the GSMA M4D Utilities Innovation Fund awarded NextDrop a grant to build and trial a water information system (WIS) for the BWSSB to track, monitor and validate water distribution timing, frequency and duration in real time for 40 per cent (over three million) of Bangalore residents. By enabling two-way communication between the BWSSB and city residents, the solution tested whether the water supply would be more reliable if supply information was available in real time.

LOOKING AHEAD: NextDrop collaborated with the non-profit Foundation for Environmental Monitoring to develop Mira, a mobile phone solution to test the water quality in Bengaluru, India. The solution is due to launch in early 2019.[29]

> Whenever the messages come, I go and check our tap and am really happy that the messages are accurate. Keep up the good work!
>
> NEXTDROP USER, BANGALORE, INDIA

eWATERPAY

PAY-AS-YOU-GO WATER IN AFRICA

LOCATION
The Gambia

USE OF MOBILE CHANNELS
Mobile Money / M2M

FIND OUT MORE
Using IoT to monitor and introduce pre-payment for remote water stands in The Gambia



PROBLEM: 35 per cent of the rural population in The Gambia relies on surface water or has extremely limited access to clean water.[30] Communal water points are managed, often informally, by village water committees that collect fees manually and maintain the taps. However, there is little accountability with the collection and spending of maintenance fees.

SOLUTION: eWATERpay has designed GSM-monitored water taps that dispense water when users present their NFC[31] tag, which accesses prepaid water credit stored on the cloud. In each village, at least one water retailer has a $130 smartphone loaned to them by eWaterPay. Credit is added either when the customer pays an agent in cash, who then uses an app on their smartphone with NFC to top up their balance, or when customers pay for it themselves using mobile money to top up their account.

GRANT SUMMARY: In April 2016, the GSMA M4D Utilities Innovation Fund awarded eWATERpay a grant to install eWATERtaps in three villages of The Gambia.

IMPACT: By June 2017, 100 taps had been installed across the Gambia. Improving services for over 9,000 people. As of December 2018, eWATERpay is operating in two more countries, Tanzania and Ghana, serving over 51,000 people. eWATERpay estimates that three times more revenue is collected through its solution than when payments are collected in cash.[32] The eWATERpay meters now have full over the air capabilities allowing real-time software updates via the GSM AnyNetSecure Sim module.

> At night, we can't go to the well but we can go to the tap. With your tag, you can take water, that's why it's important.
>
> EWATERPAY CUSTOMER, THE GAMBIA

WATER

DEVELOPMENT WORKSHOP ANGOLA

MISSED CALLS FOR MONITORING COMMUNITY WATER SERVICES

LOCATION
Angola

USE OF MOBILE CHANNELS
Mobile Services

PROBLEM

About 30% of the population of Huambo, Angola's second largest city, relies on water from often unreliable communal water points, and another 40% on unimproved shallow wells at some households. This forces people to rely on informal water vendors who sell water at 10 to 15 times the normal price.[33]

SOLUTION / PROJECT

Development Workshop Angola (DWA) and its technology partner, SeeSaw, developed the VerAgua programme to monitor communal water points. This included SeeTell, a water point status reporting system for caretakers that uses missed calls to different numbers to report different statuses, and SeeView, a mobile app for field staff to view and update the water point status in the database.

In January 2014, the GSMA M4D Utilities Innovation Fund awarded a grant to DWA to trial VerAgua in informal settlements in Huambo through a pilot of 120 water points.

LOOKING AHEAD

After the grant ended, DWA implemented a USAID-funded water and sanitation project in Huambo. They also implemented VerAgua in Luanda.

UPANDE

REMOTE MONITORING AND GIS MONITORING FOR WATER UTILITIES IN KENYA

LOCATION
Kenya

USE OF MOBILE CHANNELS
M2M Connectivity

PROBLEM

In Kenya, studies show that non-revenue water (NRW) levels among water service providers range from 31% to 85% in various counties.[34] Curbing NRW is a critical part of extending access to improved water resources for underserved Kenyans.

SOLUTION / PROJECT

Upande provides internet, web mapping and GIS services to the private sector, governments and multilateral and bilateral agencies.

In May 2015, the GSMA M4D Utilities Innovation Fund awarded a grant to Upande, in partnership with BRCK, a Kenyan company developing locally relevant connectivity solutions, to develop GSM-enabled remote monitoring sensors, a communication module and GIS tool. These were intended to measure the water flow rate and generate alerts related to leaks and bursts, and align the boundaries of the district metering areas with the master meters to calculate the losses that lead to NRW.

LOOKING AHEAD

Upande has developed Washmis further and spun off Vipimo (a Swahili word for measurement). These tools are being used by many water companies, as well as several horticultural and logistical firms.

PORTLAND STATE UNIVERSITY

MOBILE-ENABLED SENSORS TO MONITOR RURAL WATER HAND PUMPS TO IMPROVE SERVICE DELIVERY

LOCATION
Rwanda

USE OF MOBILE CHANNELS
M2M Connectivity

PROBLEM

In Rwanda, 58% of the population relies on groundwater resources.[35] According to Living Water International (LWI), over 40% of hand pumps installed in the country to access groundwater are non-functional.[36]

SOLUTION / PROJECT

Portland State University's (PSU) SweetLab and SweetSense Inc. developed mobile-enabled sensors that report the status of hand pump functionality and flag repairs for maintenance staff in real time.

In November 2013, the GSMA M4D Utilities Innovation Fund awarded a grant to PSU in partnership with LWI and SweetSense to test M2M sensors for LWI-managed hand pumps that would provide real-time data on pump uptime, frequency of use, time to repair and other key indicators. While about 181 sensors were installed for this pilot, operations in Rwanda did not have continued funding.

LOOKING AHEAD

SweetSense's low-cost remote sensors are now being widely used in about 15 countries for government, non-profit and for-profit applications in water, sanitation, energy and infrastructure. For example, sensors have been deployed for water, sanitation and hygiene projects in Ethiopia, rural Kenya and the Somalia.

WATER

THE LILONGWE WATER BOARD

AUTOMATED PREPAID URBAN WATER KIOSKS USING MOBILE MONEY

LOCATION Malawi

USE OF MOBILE CHANNELS Mobile Payments

PROBLEM

48% of the population in Malawi either relies on unprotected well/spring or surface water to meet their daily needs, or has access to less than 30 minutes of clean water supply.[37] Many households collect water from public water kiosks that are manually operated and payments are made in cash. This limits access and prevents transparent accounting.

SOLUTION / PROJECT

The Lilongwe Water Board (LWB) is a parastatal water utility organisation in Malawi with a mandate to supply potable water to the city of Lilongwe and surrounding areas.

In September 2015, the GSMA M4D Utilities Innovation Fund awarded a grant to LWB to test a solution developed to allow low-income consumers to buy water from communal water points (kiosks) at any time using NFC-enabled cards after topping up their account with mobile money.

LOOKING AHEAD

As of December 2018, due to significant operational and partnership challenges, LWB is still working to get the kiosks operational.

UDUMA S.A.S

SMART WATER HAND PUMPS USING MOBILE MONEY PREPAYMENTS

LOCATION Mali

USE OF MOBILE CHANNELS Mobile Services / Mobile Payments

PROBLEM

37% of the population in Mali does not have access to even basic clean drinking water, and a number of those who do rely on communal hand pumps to draw water.[38] Broken hand pumps lead to increased use of unsafe water and long walking distances for women and girls.

SOLUTION / PROJECT

Uduma S.A.S provides operation and maintenance services for water hand pumps and small piped water services in Mali.

In May 2017, the GSMA M4D Utilities Innovation Fund awarded a grant to Uduma to trial e-pumps in 11 municipalities in Mali. This involved using a cashless payment system through an offline POS terminal operated by a pump caretaker. Customers can pay using NFC cards connected to their mobile money account, which can be topped up at local sales points and agents. The technology also enables caretakers to receive valuable data about ongoing operations and possible maintenance requirements.

LOOKING AHEAD

Through its partnership with Orange, Uduma is aiming to increase financial inclusion through mobile money use, while also making regular water payments more affordable for low-income customers.

MANOBI

MOBILE PAYMENTS AND TOOLS FOR RURAL WATER UTILITIES IN BENIN

LOCATION Benin

USE OF MOBILE CHANNELS Mobile Payments

PROBLEM

According to the WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation, only 30% of Benin's rural population has access to piped water, compared to 57% of the urban population.[39]

SOLUTION / PROJECT

Manobi has developed the UtilitY85 platform, a digital management platform for small water pipe system operators to log operational data from their rural microwater utility networks.

In May 2015, the GSMA M4D Utilities Innovation Fund awarded a grant to Manobi to develop new functionalities for UtilitY85 that would enable mobile water bill payment and profit and loss reporting. Manobi integrated its platform with mobile operators MTN's and Moov's platforms to enable water consumers to pay their water bill using mobile money.

LOOKING AHEAD

In October 2018, Manobi was awarded a contract for $2 million to scale across Benin and provide the platform to water-piped schemes. It also plans to scale in Senegal, Nigeria, Ghana and Kenya.

3. Finding smarter ways to improve energy access through mobile technology



Since 2013, the GSMA M4D Utilities Innovation Fund has been instrumental in trialling a variety of business models to bridge the energy access gap in emerging markets. The most notable have been PAYG solar companies that have cumulatively sold nearly two million solar home systems by 2018, with the majority of the sales contributed by Innovation Fund recipients M-KOPA, Fenix, PEG and Lumos, to name a few. The PAYG model of using mobile phones to make clean energy accessible and affordable through mobile payments and M2M technology is also being replicated in other sectors, such as water (CityTaps), irrigation (SunCulture), clean cooking (KopaGas) and sanitation (Loowatt).[40]

Value chain disaggregation and the changing role of mobile operators

As the PAYG ecosystem has grown and matured in both scale and scope, PAYG companies are increasingly specialising in different activities along the PAYG value-chain. Companies such as d.Light, Angaza Design and Bboxx are now offering the PAYG hardware and software building blocks to enable new players with local knowledge to enter the market, but without the need to invest in recreating high-quality technology.

Figure 3 Source: FIBR

Distribution and consumer financing focused

Solar hardware focused	Omnivoltaic, renewit Solar solutions, AMPED INNOVATION, fosera
PAYGo software platform and/or remote lockout	angaza, Paygee, SOLARIS OFFGRID, eseye, naefos
PAYGo solution for distributors and own B2C	BBOXX, d.light, greenlight planet, azuri
Distribution + Consumer Financing focused	BrightLife, COLU, PEG, ECOENERGY
Vertically integrated	ZOLA, fenix intl, M-KOPA SOLAR
Value-added data solutions	fraym, Arifu, HARVESTING, EFL
Specialist solution / service providers	Catalyst., OPEN CAPITAL ADVISORS

This has also led mobile operators to rethink their role in the value chain and the opportunities for expanding partnerships and customer services.

- **Mobile operator-led models:** Some mobile operators are ambitiously launching their own PAYG solar businesses that provide retail as well as financing. With support of the GSMA M4D Utilities Innovation Fund in some markets, Orange Group has extended its PAYG solar home system (SHS) services from the Democratic Republic of Congo (DRC) and Madagascar[41] to Burkina Faso (through another M4D Utilities grant), Senegal, Mali, Guinea and Côte d'Ivoire. Another operator, Afghan

Wireless Communication Company, has partnered with d.light to provide PAYG SHS in Afghanistan with support from the GSMA M4D Utilities Innovation Fund. Of course, a mobile operator setting up a financial subsidiary could face its own regulatory and other challenges.[42]

- **Exclusive co-branding model:** Exclusive branding partnerships may become rarer, or not as long term, as mobile operators have a broader range of partners to choose from and solar becomes more well-known and trusted. However, in regions where PAYG solar still faces challenges like low-quality unbranded products, the market knowledge and branding anchor that mobile operators provide may be powerful.
- **Diversified model:** Specialisation in the value chain is creating an ecosystem that supports more life-enhancing devices, such as refrigerators, cooking gas, smartphones and solar water pumps. This is appealing to mobile operators, which can use these devices to target or grow specific customer segments. Pairing smartphones with PAYG solar systems has been a growing trend among companies in Africa, such as Mobisol, M-KOPA and Sunna. GSMA M4D Utilities Innovation Fund grantee, Vitalite, is also trialling a lease-to-own model that is aiming to deploy 1,500 smartphones and 500 cookstoves across rural Zambia, with mobile operators MTN and Airtel Zambia providing the mobile money payments service.

Understanding the sales and distribution gap: Challenges and opportunities

In their early days, a number of vertically integrated PAYG companies sought to leverage the last-mile sales and distribution networks of mobile operators to reach customers. This was a challenging model, due to the deep level of engagement it required between energy service providers and mobile operators. Nevertheless, some mobile operators are adopting this business model by launching their own services and tackling sales and distribution themselves. For many of the top PAYG solar companies, the unit economics of sales and distribution remain a challenge, so it will be interesting to see how mobile operators leverage their assets and experience.

In an era of value chain specialisation, a growing number of companies are choosing to focus on distribution, but many local distribution companies are finding smooth mobile money integration a challenge. Solutions like the GSMA IPN Hub (see page 11) can bridge the mobile money integration gap for energy service providers by providing a single platform for real-time notification of mobile money payments, essential for the prepaid service model. Through a single integration to the IPN Hub, energy service providers (and a range of other service providers) can receive payment notifications in real time from multiple mobile operators across multiple markets.

Off-grid moves from M2M to IoT

Some PAYG solar models rely on M2M connectivity to monitor systems remotely and halt usage if payments have not been made, enabling proactive maintenance. Others use a keypad technology to operate in areas with strong mobile network coverage. However, some companies are shifting their business models to leverage the Internet of Things (IoT) to improve device performance.[43] With the cost of sensors steadily declining, this technology, which allows devices to communicate with each other, is becoming more accessible to energy solution providers, even in emerging markets.

For example, SunCulture in Kenya, a GSMA M4D Utilities Innovation Fund grantee, sells solar-powered water pumps using M2M technology, and is now rolling out IoT-enabled systems that use soil and weather data to optimise pump activity. Another Innovation Fund recipient, SolarWorks in Mozambique, is using IoT technology and machine learning to combine weather forecasting data and user data to make solar home systems self-learning and to minimise system downtime.

Mobile operators experiment with smart metering for on-grid energy and mini-grids

On-grid urban utilities in emerging markets are shifting to smart metering to monitor energy use in near real time, which cuts costs and helps to balance supply and demand. Interestingly, a few mobile operators in Asia are taking the lead on trialling smart metering solutions for utilities. The largest mobile operator in Sri Lanka, Dialog Axiata, received a GSMA M4D Utilities Innovation Fund grant to develop and install GSM-enabled smart meters in partnership with The Lanka Electricity Company (LECO), an electricity distribution utility in Sri Lanka. This project led to the creation of a sophisticated low-voltage distribution network monitoring system that can monitor the network in real time at a very affordable price. Another Innovation Fund grantee, the Pakistani mobile operator, Jazz (Veon Group), has developed an electricity theft prevention and line-loss reduction solution for grids. It is testing smart metering systems that work at the box level on electricity distribution lines and will provide real-time monitoring and metering for the utility.

Some mobile operators are showing an increased interest in mini-grids. The use of smart meters in mini-grid power generation and consumption is enabling mini-grid operators to make decisions that will increase usage and reliability, including whether to connect new customers, to increase or decrease consumption at certain times of day or to add new generation or energy storage.[44]

Through a GSMA M4D Utilities Innovation Fund grant, Orange Burkina Faso is piloting prepaid smart metering on mini-grids in partnership with SINCO, a cooperative that manages electricity distribution through rural grids. Orange also has an online real-time dashboard synced with each meter to monitor fraud, alarms, disconnection and usage. Another grantee, Electricité de Madagascar, a Tower Company that works with the mobile operator Telma in Madagascar, is also constructing mini-grids that will be managed by GSM-enabled smart meters.

The data collected from these smart meters can be extremely useful in improving mini-grid operations. Platforms like Odyssey Energy Solutions are now able to process smart meter data from operating projects to track load, connections and financial performance in a standardised way, which we believe could be a major catalyst for scaling mini-grid models.[45]

As mobile IoT technology becomes more widely available, there is an opportunity for entrepreneurs to leverage the new cellular Low Power Wide Area (LPWA) network technology.[46] These networks are designed for lower cost IoT applications that use low data rates, need long battery life and are typically in remote locations. This is ideal for applications like smart-metering and decentralised utility service models.[47] Currently, there are very few mobile IoT networks in emerging markets in Africa and Asia. In 2016, mobile operators in the United States launched a series of new offerings and initiatives to spur innovation in IoT, including fixed annual data plans, a dedicated online programme for IoT developers, and starter kits with SIM cards, M2M modules and data plans. Applying the same type of ecosystem support in developing markets and working with local partners, such as incubators, could help to build momentum for IoT.[48]

There is no single solution to bridge the global energy access gap. Innovation in both off-grid and on-grid energy services is essential. As PAYG business models mature and replicate, and the costs of M2M sensors continue to fall, mobile-enabled energy solutions are expected to play a key role in achieving SDG 7.[49]

ENERGY

MOBISOL

PAYG SOLAR FOR ENTREPRENEURS IN RWANDA

LOCATION
Rwanda

MOBILE OPERATOR PARTNER
MTN Rwanda

USE OF MOBILE CHANNELS
SMS / Mobile Payments / M2M Connectivity

FIND OUT MORE
Mobisol Pre-Paid Solar Energy

PROBLEM: 70 per cent of Rwandans still do not have access to reliable energy services.[50] The problem is particularly challenging in rural areas where only 18 per cent of the population has access to energy.[51]

SOLUTION: Mobisol is an international company founded in 2010 that engineers, develops and delivers rent-to-own solar home and business systems, appliances and services for emerging markets. Mobisol offers off-grid customers PAYG solar home systems (SHS), including customer support and maintenance.

GRANT SUMMARY: In November 2013, Mobisol received a grant from the GSMA M4D Utilities Innovation Fund to replicate its PAYG solar business in Rwanda through a partnership with MTN, with a focus on SHS for entrepreneurs to charge phones and rent lanterns.

IMPACT: Approximately 92 per cent of Mobisol customers using the small business kit system completely replaced kerosene, candles and/or batteries with their Mobisol system. Small business owners can earn approximately RWF 25,000 (£27) per month from the phone and lantern-charging business, which exceeds the monthly cost of Mobisol's 100 W system with the business kit, and allows it to increase its profit margins. Mobisol customers make 1.7 payments per month via MTN mobile money for their Mobisol systems — very active compared to the industry benchmark for active users (one transaction every 90 days). MTN is giving Mobisol a preferential transaction fee rate for Mobisol payments. In return, Mobisol increased MTN's long-term customer loyalty through the continued use of mobile money.

LOOKING AHEAD: Mobisol aims to provide sustainable and affordable energy solutions to 20 million people by 2023. In October 2018, Mobisol received a significant follow-on growth equity investment from its main shareholders to fund growth in its priority markets (Tanzania, Kenya and Rwanda) and expand both its product range and its recently expanded B2B distributor partner business in other geographies. Mobisol also partnered with MTN and phone manufacturer Tecno to increase connectivity in rural Rwanda by offering a smartphone on a PAYG basis. In October 2018, the company joined forces with the IFC to launch the PAYG business model in a new market, Ethiopia.



> The children now have bright light to do homework. They do not use the kerosene lamp any more, the fumes made them cough at night. We feel more connected to the rest of the world through the radio and TV.
>
> MOBISOL CUSTOMER, RWANDA

ENERGY

M-KOPA

SCALING PAYG SOLAR HOME SYSTEMS IN KENYA

LOCATION
Kenya

MOBILE OPERATOR PARTNER
Safaricom

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity

PROBLEM: Nearly 44 per cent of Kenya's population lacks access to electricity.[52] Kenyans typically spend 20 per cent of their income on kerosene and charging mobile phones.[53]

SOLUTION: M-KOPA pioneered and built PAYG solar home systems launched in 2012 to provide a more cost-effective energy solution to Kenyans. The solar home system consists of a base-station with a solar panel, three lamps and a charging kit for phones. Subscribers chose a payment plan starting from £0.40 and they can qualify for upgrades to more appliances, devices and financial services. Subscriptions are affordable and accessible for low-income homes, to pay at any time, from any place with a mobile signal.

GRANT SUMMARY: In December 2013, M-KOPA received a grant from the GSMA M4D Utilities Innovation Fund to expand its offering to include a low-power television. The grant tested whether the repayment behaviours of target customers were strong enough to support additional credit-based energy financing for SHS with televisions.

IMPACT: After the GSMA project, M-KOPA expanded its operations to Uganda and in November 2018 it surpassed 100,000 Ugandan connected homes and businesses. By January 2019 M-KOPA has connected over 700,000 homes across Africa, making it the biggest off-grid PAYG provider globally. M-KOPA has sold over 210,000 PAYG TV's[54] and it has recently launched a larger model with a 32 inch flat screen. According to M-KOPA, its current customer base is expected to make projected savings of over £400M by 2022, by replacing kerosene and accessing affordable appliances. In October 2018 it announced a pilot of Mastercard's Quick Response payment technology to enable more secure payments in markets without an established mobile money system.[55]

LOOKING AHEAD: In October 2017, M-KOPA secured £61 million in committed finance.[56] M-KOPA recently released a consumer finance product - Solapesa. Subscribers can use their M-KOPA device to access cash loans with tailored repayment plans.



> M-Kopa has actually changed my life because since I bought it...I started using it to light three rooms and even charging...even my neighbours benefit from charging their phones.
>
> M-KOPA CUSTOMER, KENYA

ENERGY

LUMOS

PAYG SOLAR USING AIRTIME PAYMENTS IN NIGERIA

LOCATION
Nigeria

MOBILE OPERATOR PARTNER
MTN

USE OF MOBILE CHANNELS
Airtime Payments / M2M Connectivity

FIND OUT MORE
Lumos: Pay-as-you-go solar in Nigeria with MTN

PROBLEM: 40 per cent of Nigeria does not have access to electricity,[57] and over 80 percent of all Nigerians (180 million) rely on petrol generators as a primary or back-up source of energy.[58] As a result, domestic and commercial consumers spend an estimated £11 billion annually to power 14 GW of small-scale diesel and petrol generators.[59]

SOLUTION: Lumos designs and manufactures mobile-enabled solar home systems and partners with mobile operators to make PAYG solar available in markets with a large addressable off-grid population.

GRANT SUMMARY: In December 2013, the GSMA M4D Utilities Innovation Fund awarded Lumos a grant to trial PAYG solar services with MTN Nigeria. MTN Mobile Electricity, an MTN and Lumos co-branded service, offers off-grid customers in Nigeria energy as a service via SHS. This PAYG model was enabled by the use of airtime credit and GSM-based M2M connectivity to remotely control and monitor the usage, billing and performance of an SHS.

IMPACT: As of June 2018, Lumos has sold over 88,000 SHS in Nigeria and Côte d'Ivoire, with over one million beneficiaries. The mobile airtime payment transactions generated by Lumos end users increased from 514,850 in 2016 to 1.2 million in 2017, and are expected to be above one million in 2018 in Nigeria alone. The Lumos SHS is now available in over 300 stores across Nigeria, up from 86 in 2016.[60]

LOOKING AHEAD: Lumos has expanded beyond Nigeria into Côte d'Ivoire, continuing its partnership with MTN. Over the next three years, Lumos is aiming to sell five million SHS in Nigeria and another million through expansion into other markets, including Côte d'Ivoire, Ethiopia and the Philippines.[61] Lumos also plans to add more services and adapt to a range of markets, such as SMEs and the rural poor.



> When we had a major blackout at Christmas, I was glad I had the solar because I didn't have to join everyone chasing around for fuel.
>
> SCHOLA ANDEM,
> LUMOS CUSTOMER, NIGERIA

ENERGY

PEG AFRICA

DISTRIBUTION OF SOLAR THROUGH LICENSING IN GHANA

LOCATION
Ghana

MOBILE OPERATOR PARTNER
Tigo / Airtel / MTN

USE OF MOBILE CHANNELS
SMS / Voice / M2M Connectivity

FIND OUT MORE
Lessons learned from our grantees: PEG Ghana

PROBLEM: While 45 per cent of people in Ghana live in rural areas, 34 per cent do not have access to grid electricity.[62] They can spend up to 30 per cent of their income on poor-quality, polluting fuels like kerosene, candles and batteries, and often have to travel many miles simply to charge their mobile phones.[63]

SOLUTION: PEG Africa was launched in 2013 to provide PAYG energy services in Ghana's off-grid market. PEG focuses on building value through distribution, financing and branding across the PAYG value chain.

GRANT SUMMARY: In December 2013, the GSMA M4D Utilities Innovation Fund awarded PEG a grant, in partnership with Tigo, Airtel and MTN, to provide prepaid solar energy services to six villages in Ghana through both microgrid and solar home systems with one business. While both technologies had already been tested and were being used in Tanzania, the grant tested the potential to scale an energy service business in a new market that licensed existing third-party hardware and software rather than developing it themselves.

IMPACT: Although PEG changed suppliers and decided to focus only on SHS, the model proved successful and helped them raise £16 million in funding over several rounds over the last three years.[64] Following this project, PEG expanded its services to Côte d'Ivoire and Senegal, and now employs over 400 full-time staff and 550 commission-based sales agents. In January 2017, PEG announced a new nationwide partnership with BIMA, the global microinsurance and health pioneer, and Prudential Life, which would provide eligible PEG customers with free insurance cover as a reward for loyalty and timely loan repayment.[65] By 2017, it had reached 11,000 families with its hospital insurance scheme.[66]

LOOKING AHEAD: PEG Africa aims to electrify 500,000 households in West Africa by 2020.[67]



> PEG Ghana helps by helping me to sell things even when electricity is not available. Having light at all times has made my store more attractive to customers.
>
> FEMALE SHOPOWNER
> AND USER OF PEG, GHANA

ENERGY

FENIX INTERNATIONAL

CALING PAYG SOLAR IN UGANDA

LOCATION
Uganda

MOBILE OPERATOR PARTNER
MTN Uganda

USE OF MOBILE CHANNELS
SMS / Mobile Payments

FIND OUT MORE
The power of mobile to improve access to energy: Fenix and MTN Uganda's story

PROBLEM: Only 27 per cent of Ugandans have access to reliable and affordable energy.[68] The World Bank's 2018 *Doing Business* report identifies the cost of electricity as a particular impediment to private sector development in Uganda, with the country ranking significantly below regional counterparts, such as Kenya and Rwanda, in the "getting electricity" category.[69]

SOLUTION: Fenix International, headquartered in Kampala, was founded in 2009. Fenix designs, manufactures and distributes ReadyPay Solar, a mobile payment-enabled solar panel and smart power system that empowers off-grid residents with convenient, affordable access to clean electricity.

GRANT SUMMARY: In February 2014, Fenix received a grant from the GSMA M4D Utilities Innovation Fund to scale its new PAYG system, ReadyPay Power, to enable solar-powered lighting and phone charging. It also tested the introduction of ReadyPay home and business products through joint marketing and distribution with MTN.

IMPACT: In 2014 alone, Fenix's 13,000 customers made over 100,000 mobile money transactions. Thirteen per cent of ReadyPay Solar customers were not previously MTN Mobile Money customers, and 70 per cent of those surveyed said their impression of MTN had improved significantly with its association with ReadyPay Solar. As of November 2018, following its acquisition by ENGIE in April 2018,[70] Fenix has grown into a pan-African energy provider serving over 350,000 households across three markets (Uganda, Zambia and Côte d'Ivoire), still in close partnership with MTN.

LOOKING AHEAD: In late 2018, Fenix launched its PAYG solar service in Nigeria and Benin, and is planning to expand to other African markets in 2019.



> In my shop, I sell drinks, and food. With ReadyPay solar, I can operate my shop for longer hours and generate money from letting people charge their phones.
>
> ROBINAH NAMIREMBE,
> SHOPKEEPER, UGANDA

ENERGY

ECOENERGY

PAYG SOLAR IN PAKISTAN

LOCATION
Pakistan

USE OF MOBILE CHANNELS
SMS / Mobile Payments / M2M

FIND OUT MORE
EcoEnergyFinance: Distribution of solar pay-as-you-go in Pakistan

PROBLEM: In 2012, Pakistan had an electrification rate of 69 per cent, with 57 per cent access in rural areas and 88 per cent access in urban areas.[71] Meanwhile, about 85 per cent of the country's 182 million people have access to GSM networks.[72] Thus, Pakistan's addressable energy market, defined as the number of people with access to GSM networks but not to electricity, is estimated at 29 million people, or 16 per cent of the population.

SOLUTION: EcoEnergy delivers solar home systems (SHS) on a PAYG basis to remote and off-grid customers in Pakistan through its integrated sales and service network.

GRANT SUMMARY: In February 2014, EcoEnergy (formerly EcoEnergy Finance) received a grant from the GSMA M4D Utilities Innovation Fund to sell 50 SHS with GSM-based M2M connectivity and 750 solar lanterns on a PAYG basis in partnership with mobile wallet provider, UBL OMNI in Sindh, Pakistan.

IMPACT: EcoEnergy has been selling lanterns without PAYG technology on cash or credit since 2013. Sixty-four per cent of EcoEnergy customers cited time savings as the major benefit of its services. Other perceived benefits of the service were improved health (40 per cent), entertainment (39 per cent) and money savings (29 per cent). Following the grant, EcoEnergy entered a partnership with BBOXX, which enabled it to expand, respond to technological difficulties and attract financing. In November 2017, EcoEnergy acquired Brighterlite Pakistan's customer portfolio. Since the two companies have targeted slightly different markets, and Brighterlite Pakistan produces smaller 12 W to 40 W products compared to EcoEnergy's 50 W and 100 W BBOXX systems, EcoEnergy can upgrade customers to more powerful systems as their energy needs grow.

LOOKING AHEAD: After receiving a £460,000 debt financing deal in March 2018 from Social Investment Managers and Advisors (SIMA), a social investment firm backed by Dutch and Belgian government development banks, EcoEnergy aims to reach 10,000 households by the end of 2019.



> Ever since I installed solar energy, I save some money, and it is quiet and peaceful. My clients used to be disappointed because they would come here to watch films and the generators wouldn't start sometimes. This is better for my restaurant.
>
> OBHAYO KHASKHELI, ECOENERGY CUSTOMER, SINDH, PAKISTAN

ENERGY

GHAM POWER

TELECOM TOWERS AS ANCHORS OF GRID POWER IN RURAL NEPAL

LOCATION
Nepal

MOBILE OPERATOR PARTNER
NCell (Axiata)

USE OF MOBILE CHANNELS
Mobile Infrastructure / Mobile Payments / M2M

FIND OUT MORE
Finding a replicable model for mobile-enabled micro-grids with NCell in Nepal

PROBLEM: Despite considerable hydropower resources, only 76 per cent of Nepal's population has access to electricity. There is also a wide urban-rural gap, with about 94 per cent of city dwellers benefitting from energy access compared to just 61 per cent of the rural population.[73]

SOLUTION: Founded in 2010, Gham Power develops solar microgrids and commercial off-grid systems in developing countries. It focuses on developing projects that are good fits with PAYG models, including rural microgrids, commercial and industrial systems and productive end-use systems.

GRANT SUMMARY: In May 2015, Gham Power received a grant from the GSMA M4D Utilities Innovation Fund to expand the capacity of two microgrids in Nepal, improving energy access for two rural villages and providing energy to two NCell telecom towers. Mobile money was used for bill payment and smart meters were deployed to monitor individual consumption.

IMPACT: Following the grant-funded project, Gham Power customers reported an across-the-board increase in appliance ownership 10 months after connecting to the microgrid. About 22.5 per cent of SMEs using Gham Power's service reported higher profit (including small hotels or roadside eateries that added refrigerators or cold storage to improve business), with most attributing the change to the addition of new appliances. Increased access to any type of energy, coupled with better mobile service, also increased mobile use. For mobile operator NCell, airtime expenditure from Gham Power users increased by 17 per cent, mobile internet usage increased by 32 per cent and smartphone ownership rose by 44 per cent. Following the GSMA grant, Gham Power deployed two more 15 kW microgrids reaching 128 households in rural Nepal. As of November 2018, the company has delivered over 2.5 MW of installed energy capacity across 2,000 projects, impacting over 10,000 people.

LOOKING AHEAD: Gham Power is seeking to establish itself as a market leader in Nepal's solar market, while placing an even greater importance on productive end-use systems, such as solar pumps. Given that only five per cent of Nepalese farmers use electric/diesel pumps, this represents a significant opportunity for expansion.



> Before connecting to the microgrid, we could only work for six hours. Now we are able to operate for longer hours and have introduced computer classes. Access to reliable energy helped expand the business; our income has almost doubled since.
>
> GHAM POWER CUSTOMER AND BUSINESS OWNER, CHAYASMITAR, NEPAL

ENERGY

KOPAGAS

PAYG CLEAN COOKING SERVICE IN TANZANIA

LOCATION
Tanzania

MOBILE OPERATOR PARTNER
Vodacom, Airtel

USE OF MOBILE CHANNELS
Mobile Payments / M2M

FIND OUT MORE
Mobile-enabled Pay-as-you-Cook service in Tanzania

PROBLEM: In Tanzania, over 90 per cent[74] of the country's 57 million people use solid fuels, such as charcoal and wood, as their main source of energy for cooking. This has detrimental effects on the safety and respiratory health of families and the country's environment.

SOLUTION: KopaGas, founded in 2014, makes clean, efficient liquid petroleum gas (LPG) affordable and available to low-income households through its pioneering PAYG smart metering technology, in partnership with Tanzania's leading LPG importer.

GRANT SUMMARY: In September 2015, KopaGas received a grant from the GSMA M4D Utilities Innovation Fund to design a low-cost meter for LPG canisters and test a PAYG cooking gas service with 150 households in Tanzania. In May 2018, KopaGas received another GSMA grant to validate fundamental market and operational assumptions to strengthen the PAYG business model for scale. KopaGas also partnered with Airtel to roll out a cashback programme that seeks to promote positive customer behaviour and increase stickiness for Airtel and KopaGas services.

IMPACT: The "Pay-as-you-Cook" pilot improved access to clean cooking fuel for 148 households and two small-scale food stands, reaching a total of 870 people (90 per cent of whom were women and 48 per cent were living below the poverty line). As of June 2018, the company has reached over 500 households with its pay-as-you-cook model and its gas distribution business, which accounts for seven percent of LPG distributed in Tanzania.

LOOKING AHEAD: KopaGas aims to reach 2000 households by March 2019. It has recently received additional support from impact investor Acumen, which it seeks to leverage to become the largest distributor of LPG in Tanzania. KopaGas also recently unveiled the KopaMeter 4.0, a more sophisticated IoT-enabled smart meter, which will allow it to serve more customers more efficiently.



> I'm convincing other women to also buy gas. Using it has been much better for my health and my children's health than charcoal, it also helps keep the environment clean.
>
> KOPAGAS VENDOR, TANZANIA

ENERGY

SUNCULTURE

MAKING IRRIGATION ACCESSIBLE TO KENYAN FARMERS WITH SOLAR POWER

LOCATION
Kenya

USE OF MOBILE CHANNELS
SMS / Mobile Payments / M2M

FIND OUT MORE
Changing lives through mobile-enabled solar irrigation

PROBLEM: Improving agricultural output is critical to reducing poverty in Kenya. Irrigation is key to increasing farmers' productivity and output, but just four per cent of irrigable land in Kenya is currently under irrigation.[75] Many traditional diesel-powered irrigation pumps have proven to be too costly and carbon-intensive.

SOLUTION: SunCulture, founded in 2012, designs and sells solar-powered irrigation systems that make it cheaper and easier for farmers in Kenya to grow high-value fresh fruits and vegetables.

GRANT SUMMARY: In September 2015, SunCulture received a grant from the GSMA M4D Utilities Innovation Fund to develop, trial and set up Rain Maker, an affordable PAYG solar-powered irrigation solution that extends access to water pumping solutions to underserved smallholder farmers and communities in the developing world (starting with Kenya).

IMPACT: Over 26 per cent of SunCulture's customers switched from diesel-generated water pumps to using the solar pump as their main source of irrigation, while 70 per cent of customers use the pump to get their household water supply. About 70 per cent of customers pay for the product using PAYG. Most importantly, SunCulture farmers have reported an average increase in crop yield of 300 per cent per year.

LOOKING AHEAD: In August 2018, SunCulture secured funding from EDF, one of the world's largest electric utility companies and a global leader in low-carbon energy. SunCulture is opening the East African market for EDF to expand its off-grid solutions across the continent, while EDF will share its experience selling and installing off-grid solutions for residential customers and its knowledge of Central and West African markets. Sunculture is also rolling out its new RainMaker2 with ClimateSmart™, an IoT-enabled device, which uses soil weather data to optimise pumping activity.



> I decided to buy the SunCulture pump to make life easier and not constantly deal with the challenge of getting water from the well, using a bucket all the time. Now I am at least able to use the irrigation method for my plants.
>
> SUNCULTURE USER, KENYA

ENERGY

D.LIGHT

DRIVING MOBILE MONEY ADOPTION IN A GREENFIELD MARKET WITH A PAYG SOLAR SERVICE

LOCATION
Haiti

MOBILE OPERATOR PARTNER
Digicel

USE OF MOBILE CHANNELS
Mobile Money / M2M

FIND OUT MORE
d.light and RE-VOLT: Pay-as-you-go solar service driving mobile money adoption in Haiti

PROBLEM: 60 per cent of Haiti is still unelectrified, with rural areas much worse off than urban areas.[76] Haiti has also experienced frequent earthquakes and floods, which disrupt grid electricity where it is available.

SOLUTION: d.light provides affordable distributed solar energy solutions for households and small businesses, with a focus on designing and supplying a variety of SHS hardware products. In Haiti, d.light has developed a business model designed to simultaneously drive mobile money adoption and expand energy access.

GRANT SUMMARY: In December 2015, the GSMA M4D Utilities Innovation Fund awarded d.light a grant in partnership with RE-VOLT and Digicel to scale up a lease-to-own energy model in Haiti through the distribution of PAYG SHS and to test the impact of PAYG solar on the adoption of Digicel's Mon Cash mobile money service.

IMPACT: At the time of the grant, Haiti was still a nascent mobile money market, with seven per cent of the population subscribing to mobile money and three per cent actively using mobile money accounts (December 2015). By the end of the grant (December 2017), this had risen to 16 per cent and eight per cent, respectively.[77] According to Digicel data, 43 per cent of RE-VOLT customers were new mobile money users. Moreover, the introduction of a PAYG SHS increased Digicel's ARPU for its RE-VOLT customers by 20 per cent, from HTG 759 (£9) to 913 (£10), indicating that these systems can boost mobile revenues.

LOOKING AHEAD: Through its four hubs in Africa, China, South Asia and the United States, d.light has sold over 20 million solar light and power products in 65 countries, improving the lives of over 85 million people. d.light aims to reach 100 million people by 2020. In the last two years, d.light has raised over £75 million in funding, with the most recent £31 million equity investment coming from a consortium led by Inspired Evolution, an Africa-focused investment advisory firm that specialises in the energy sector.[78]



> I really appreciate the SHS because it took me out of darkness. Now I just have to press a button and I have light. I am afraid of the dark. It has changed my life. You hear about candles falling on tables, on tablecloths; candles are disgusting. I do not like them. Candles dirty your house, they can even start a fire. I am able to save money on the two to three candles a day that I used to buy. The RE-VOLT system is easier, it has class.
>
> CARLO SAINT-HILLAIRE,
> D.LIGHT CUSTOMER, HAITI

ENERGY

DEVERGY

SOLAR PV-BASED MICROGRIDS IN TANZANIA

LOCATION
Tanzania

USE OF MOBILE CHANNELS
SMS / Mobile Payments / M2M

FIND OUT MORE
Devergy: Leveraging a mobile services bonus to encourage the use of mobile money wallets for smart solar mini-grids in Mbeya, Tanzania



PROBLEM: Only 33 per cent of Tanzanians have access to energy.[79] Particularly low energy access in rural areas (17 per cent) is a severe constraint on average household consumption and productivity.

SOLUTION: Devergy is a Tanzania-based energy services company that provides affordable and reliable energy to low-income households in rural villages through smart mini-grids that allow customers to prepay using mobile money.

GRANT SUMMARY: In May 2015, Devergy received a grant from the GSMA M4D Utilities Innovation Fund to expand its smart mini-grids in Tanzania's Mbeya region.

IMPACT: Devergy customers, 60 per cent of which live below the poverty line, reported spending 20 per cent less on lighting and phone charging after becoming Devergy customers.[80] Seventeen per cent did not have a mobile money account prior to the Devergy service offering and opened one in order to use it. Sixty-four per cent of users reported using mobile money more since becoming Devergy customers. In March 2017, Tigo Tanzania launched Tigo Bonus, an extra airtime, data and SMS offering unique to Devergy customers to drive higher average purchase amounts by customers using their own Tigo Pesa wallet.

LOOKING AHEAD: As of October 2017, with support from Development Innovation Venture (DIV) and in partnership with the Power Africa Initiative, Devergy has tested various productive use models to encourage customers to use its power connections for income-generating purposes, helping to move its customers up the energy ladder. Devergy grids will cover the needs of both residential and business customers, up to and including refrigeration and freezing for businesses.[81]

> Previously I was using my own solar panels, which would stop working at 20:00 or 21:00. Now I can work as late as I like.
>
> D. SKAMANGA, DEVERGY CUSTOMER, TANZANIA

KAMWORKS

INTRODUCING PAYG SOLAR IN A GREENFIELD ASIAN MARKET

LOCATION
Cambodia

USE OF MOBILE CHANNELS
Mobile Payments / M2M

FIND OUT MORE
Kamworks: Introducing GSM-enabled PAYG solar in Cambodia



PROBLEM: Although energy access in Cambodia is nearly universal in urban areas (99 per cent), it is still very low in rural areas (36 per cent).[82] In contrast, about 99 per cent of Cambodia's population has access to GSM networks, which can be leveraged to extend rural energy access.

SOLUTION: Kamworks, established in Cambodia in 2006, provides a range of solar technologies, from PAYG SHS to rooftop solar systems for schools and large buildings. After initially selling SHS on a cash basis and experimenting with microfinance partnerships, Kamworks launched a programme to scale up credit sales in 2013. In parallel, Kamworks designed its own GSM-enabled SHS technology to collect payments using mobile money.

GRANT SUMMARY: In November 2013, Kamworks received a grant from the GSMA M4D Utilities Innovation Fund to develop and sell/rent PAYG SHS with M2M connectivity in rural Cambodia and integrate them with mobile money for payment collection.

IMPACT: Ninety-eight per cent of Kamworks' customers appreciated the convenience of paying using Cellcard's WING mobile money service. Kamworks sold or rented the 300 GSM-enabled SHS by May 2015 under the grant-funded project. Over 500 GSM-enabled systems were sold by November 2015 and, as of November 2018, Kamworks has sold over 14,000 SHS throughout Cambodia and has 98 per cent market share of Cambodia's PAYG marketplace.

LOOKING AHEAD: Kamworks has diversified its SHS portfolio to include multiple customer segments with different energy requirements and payment capabilities. It has also started to offer its clients add-on products for productive use, such as solar water pumps.

> Our life is much better. We have four LED lamps; we find it easy to charge our devices; we know when the system has discharged. And every six months we get a free maintenance visit by Kamworks' technicians.
>
> THEA, KAMWORKS CUSTOMER, CAMBODIA

ENERGY

AFRICAN SOLAR DESIGNS (ASD)

TELECOM TOWERS AS ANCHORS OF COMMUNITY-BASED POWER PROVISION

LOCATION
Kenya

USE OF MOBILE CHANNELS
Mobile Infrastructure

PROBLEM

Although energy access in rural Kenya has increased, 44% of rural residents still do not have access to energy.[83]

SOLUTION / PROJECT

African Solar Designs (ASD) was founded in 2008 as a clean energy advisory and engineering solutions company in Kenya. It provides bespoke off-grid solar solutions to companies across East Africa and consulting for government and international development agencies. In February 2014, ASD received a grant from the GSMA M4D Utilities Innovation Fund to trial a solar-diesel hybrid energy system for powering an off-grid telecom tower as the anchor load, as well as surrounding businesses and communities.

The project was not successful due to delays in negotiations in the power purchase agreement with Airtel and later Africa Towers, which overlapped with a sale of the towers to Eaton Towers.

LOOKING AHEAD

Drawing on the lessons of this project, ASD is seeking to take advantage of renewed interest in telecom towers as anchors of community-based power provision, and trial more anchor-based models throughout East Africa.[84]

PRODUCT HEALTH SERVICE

MOBILE-ENABLED B2B SERVICES FOR SOLAR HOME SYSTEM PROVIDERS

LOCATION
Tanzania, Bangladesh, Kenya

USE OF MOBILE CHANNELS
M2M Connectivity

PROBLEM

Across emerging markets, SHS providers are investing in remote control and monitoring hardware and software. Reducing these costs through economies of scale could unlock vital funds that could be used to scale and reach more customers.

SOLUTION / PROJECT

Product Health Service offers data analytics solutions to energy providers by analysing raw data from connected hardware (e.g. a connected battery) using an embedded GSM module or WI-FI connection. In May 2015, Product Health received a grant from the GSMA M4D Utilities Innovation Fund to provide remote battery monitoring to three SHS manufacturers and distributors in Tanzania (NIWA), Bangladesh (BGEF) and Kenya (Barefoot Power).

Product Health closed operations in 2016 due to issues related to product pricing and intense market competition.

LOOKING AHEAD

There are now many more B2B providers in the SHS sector providing some pieces of the value chain, but Product Health has closed its operations.

EMERGENCE BIOENERGY

LEVERAGING BIOMASS POWER FOR TELECOM TOWERS AND COMMUNITIES IN BANGLADESH

LOCATION
Bangladesh

USE OF MOBILE CHANNELS
Mobile Services / Mobile Payments / Mobile Infrastructure

PROBLEM

Although nationwide access to energy in Bangladesh increased from 9% in 1990 to over 75% in 2016, rural energy access remains below 70%, with more than 89% of the off-grid population concentrated in rural areas.[85]

SOLUTION / PROJECT

Emergence BioEnergy, Inc. (EBI) was founded in 2008 and opened its first branch office in Bangladesh in 2013. The company aimed to deploy small-scale, farm waste-to-energy, distributed power generation systems in remote locations. In May 2015, EBI received a grant from the GSMA M4D Utilities Innovation Fund to trial an innovative, small-scale, biomass-fuelled Stirling engine in Bangladesh as the generation technology for telecom towers, and for businesses and households in the vicinity of the towers.

EBI faced significant logistical and technical challenges and the biomass engine solutions did not succeed. EBI closed in 2015.

LOOKING AHEAD

While there is still interest in business models that use renewable energy to power an off-grid tower and nearby businesses and communities, these models have faced challenges (see our 2016 annual report), including assurance of reliable energy supply.

ENERGY

SNV

PAYG SOLAR LANTERNS IN BENIN

LOCATION
Benin

USE OF MOBILE CHANNELS
Mobile Payments

PROBLEM

In Benin, 82% of the population in rural areas is not connected to the electricity grid and relies on lanterns that run on dirty and costly kerosene.[86] Many people spend a significant amount of money on charging their phones at local kiosks (FCFA 550 or around £0.77 a week, according to SNV's research).

SOLUTION / PROJECT

In September 2015, the GSMA M4D Utilities Innovation Fund awarded a grant to **SNV**, an international NGO, and ARESS, a local solar distributor, to trial the sale of solar lanterns with PAYG technology to make these lower-cost lighting products even more affordable for the poorest customers. ARESS and SNV partnered with MTN to use MTN agents for lantern sales and distribution and MTN Mobile Money for payments.

LOOKING AHEAD

ARESS is now selling SHS in Benin and has about 10,000 PAYG solar customers. 50% of its sales agents are MTN agents, while about 30% are ARESS agents and 20% are from other channels.

VILLAGE INFRASTRUCTURE

SOLAR-POWERED PAYG AGRO-PROCESSING MILLS

LOCATION
Vanuatu

USE OF MOBILE CHANNELS
M2M Connectivity

PROBLEM

In the South Pacific island of Vanuatu, approximately 50% to 60% of its 250,000 people live in off-grid villages outside of the main towns with no access to electricity.[87]

SOLUTION / PROJECT

In September 2015, the GSMA M4D Utilities Innovation Fund awarded a grant to **Village Infrastructure Angels** (VIA), an angel investment group, to provide PAYG SHS and solar agro-processing mills monitored remotely through M2M technology. In the absence of mobile money in Vanuatu, VIA used SMS to send unlock codes to customers once they had made payments. At the end of the pilot, VIA had provided an SHS to about 1,250 households and installed 25 M2M sensors on agro-processing mills.

LOOKING AHEAD

Despite the challenge of operating PAYG without mobile money, VIA has continued to grow in Vanuatu, with over 2,500 PAYG SHS customers and 500 solar mills. It has also expanded to Indonesia where it has about 5,000 PAYG SHS customers, and another 5,000 are being shipped to Vanuatu and Honduras.

SOLSHARE

SMART NANOGRIDS FOR RURAL ELECTRIFICATION

LOCATION
Bangladesh

USE OF MOBILE CHANNELS
Mobile Services / Mobile Payments / M2M Connectivity

PROBLEM

By May 2017, 4.12 million solar home systems had been installed in off-grid areas of Bangladesh.[88] Although these systems have been very successful in Bangladesh, an estimated 600,000 kWh energy produced through SHS is wasted every day due to lack of energy storage infrastructure.[89]

SOLUTION / PROJECT

ME SOLshare has developed a peer-to-peer solar electricity trading platform (SOLgrid) that leverages existing SHS in an off-grid context. SOLgrid is enabled by a smart meter (SOLBox) and a software backend, including a data collection and analysis platform that is integrated with mobile money providers, such as bKash, DBBL and IFIC, and a mobile app to support field agents.

In September 2015, the GSMA M4D Utilities Innovation Fund awarded a grant to ME Solshare to trial its innovative bottom-up approach to building DC nanogrids by connecting distributed solar home systems in Bangladesh.

LOOKING AHEAD

ME SOLshare and Grameen Shakti have recently received an £0.7 million UN DESA grant to deploy 100 microgrids to reach at least 15,000 beneficiaries.[90] ME SOlshare also intends to expand its presence in Bangladesh and India to the rest of Asia.

ENERGY

DIALOG AXIATA

MOBILE OPERATOR-LED SMART METERING IN PARTNERSHIP WITH AN ELECTRIC UTILITY

LOCATION
Sri Lanka

USE OF MOBILE CHANNELS
M2M Connectivity

PROBLEM

In urban Sri Lanka, the Lanka Electricity Company (LECO) faced challenges providing consumers with consumption and billing information to reduce consumption and control costs, particularly for low-income customers.

SOLUTION / PROJECT

Dialog Axiata is the largest mobile operator in Sri Lanka with a mobile subscriber base of over 13 million as of the end of 2018.[91] In September 2015, Dialog Axiata (in partnership with LECO) received a grant from the GSMA M4D Utilities Innovation Fund to offer smart metering to the domestic market and improve power distribution network monitoring capability.

The project faced technical and regulatory challenges, but 2,500 meters have been installed with plans to test prepaid functionality.

LOOKING AHEAD

Dialog, LECO and the government are enthusiastic about the service and 25,000 additional meters have been manufactured. LECO plans to deploy 100,000 over the next two years.

SOLARWORKS!

MACHINE LEARNING-ENABLED SOLAR HOME SYSTEMS IN MOZAMBIQUE

LOCATION
Mozambique

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity

PROBLEM

More than 75% of Mozambique's population lacks access to energy due to limited transmission and distribution networks, and unfavourable market conditions for new generation. This figure rises to 95% in rural areas.[92]

SOLUTION / PROJECT

Based in the Netherlands, South Africa and Mozambique, **SolarWorks!** was founded in 2007 to sell solar home systems and related products to off-grid households and small businesses in rural and peri-urban areas of Mozambique.

In June 2018, SolarWorks! received a grant from the GSMA M4D Utilities Innovation Fund to improve access to energy services for residents in Mozambique by testing machine learning optimisation of their solar home systems. The tool combines weather forecasting data and user data to make SHS self-learning and reduce system downtime. Through the grant, SHS downtime has been minimised, resulting in greater customer satisfaction and lower energy costs due to higher repayment rates.

LOOKING AHEAD

In October 2018, the renewable energy investor EDP purchased a stake in SolarWorks!. The investment will give a boost to the company's goal to expand from Mozambique into Malawi and other markets in southern Africa.

ENERGY

SIMGAS

REMOTE-CONTROLLED CLEAN COOKING SOLUTIONS IN KENYA

LOCATION
Kenya

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity

PROBLEM

Over 80% of Kenya's population relies on solid fuel for household cooking. Exposure to smoke from traditional cookstoves and open fires causes 16,600 deaths in Kenya every year.[93]

SOLUTION / PROJECT

SimGas, founded in 2009, offers affordable, high-quality biogas systems for household use in Kenya.

In May 2018, SimGas received a grant from the GSMA M4D Utilities Innovation Fund to install a remote monitoring and control system with smart meters to monitor and control real-time performance of biogas digesters for smallholder farmers. The aim of the project is to prove that the system will increase and improve biogas access and enable the business model to scale.

LOOKING AHEAD

Simgas has installed over 100 modules as of November 2018, and plans to offer the smart meters to other biodigester companies to enable scale in the sector.

SMARTER GRID

PILOTING MOBILE PAYMENTS FOR SOLAR HOME SYSTEMS IN NIGERIA

LOCATION
Nigeria

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity

PROBLEM

120 million people, or 75% of the Nigerian population, are living without access to reliable and affordable power.[94] Meanwhile, Nigeria's off-grid sector is dominated by over 60 million diesel generators,[95] which are not only dirty and environmentally damaging, but also inexpensive and ineffective.

SOLUTION / PROJECT

Smarter Grid International is an SHS distributor founded in 2015 in Nigeria.

In May 2018, Smarter Grid International received a grant from the GSMA M4D Utilities Innovation Fund to work with Airtel Nigeria to launch mobile payments for PAYG solar systems. It is also expanding its sales to reach more states and regions in Nigeria.

LOOKING AHEAD

As part of SGI's grant, the company will focus on training at least 50 women as technicians and agents. This is a key sales strategy to reach women customers.

JAZZ

MOBILE-ENABLED ELECTRICITY THEFT PREVENTION IN PAKISTAN

LOCATION
Pakistan

USE OF MOBILE CHANNELS
M2M Connectivity

PROBLEM

The Pakistani Senate Committee on Circular Debt estimates the cost of power theft during 2017–18 was over Rs 53 billion (£295 million).[96]

SOLUTION / PROJECT

Jazz is the largest mobile operator in Pakistan with a user base of over 56 million as of the end of 2018.[97]

In May 2018, Jazz received a grant from the GSMA M4D Utilities Innovation Fund to develop and implement mobile-enabled theft prevention and a system loss reduction solution for a mainstream grid distributor. Jazz, along with its technology partner CISNR and grid distributor PESCO, is designing, developing and implementing an electricity theft prevention and distribution line-loss reduction solution.

LOOKING AHEAD

Jazz's smart metering system has been designed in collaboration with CISNR to perform household metering at a centralised distribution point where individual household connections meet, eliminating the need for a meter at every household and reducing the cost of the system.

ENERGY

ELECTRIC VINE INDUSTRIES

MICROGRIDS TO ELECTRIFY RURAL INDONESIA

LOCATION
Indonesia

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity

TELKOMSEL

PROBLEM

Although rural electricity access in Indonesia stands at 95%,[98] it is often unreliable, forcing Indonesians to purchase costly and environmentally damaging generators.

SOLUTION / PROJECT

Electric Vine Industries (EVI) is a Jakarta-based private microgrid developer founded in 2015.

In June 2018, EVI received a grant from the GSMA M4D Utilities Innovation Fund to integrate TCASH, Telkomsel's mobile money service, into EVI's power metering payment platform.

LOOKING AHEAD

Following a pilot in five villages in Sumba, EVI will expand to cover the entire island and Papua New Guinea. This £184 million project is supported by Engie.[99] EVI will also launch a device-leasing programme to enable users to manage and purchase electricity on demand through their EVI wallet.

ELECTRICITÉ DE MADAGASCAR

MOBILE-ENABLED SOLAR-POWERED MINI-GRID FOR REMOTE VILLAGES

LOCATION
Madagascar

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity

Telma Sagemcom

PROBLEM

Over the last 20 years, demand for electricity in Madagascar has increased by an average of 5% per year.[100] Despite some progress, only 22% of Madagascar's population has access to electricity.[101]

SOLUTION / PROJECT

Electricité de Madagascar was founded in 2005 to offer a range of energy solutions to Malagasy households.

In May 2018, Electricité de Madagascar received a grant from the GSMA M4D Utilities Innovation Fund to deploy mini-grids in three rural off-grid villages in the north of Madagascar. The mini-grids are supported by mobile to enable smart metering and mobile payments. Telma serves as the anchor client, while Sagemcom is the project's smart meter hardware provider.

LOOKING AHEAD

Electricité de Madagascar aims to launch three mini-grids in the north of the country that are expected to reach approximately 300 households by 2019.

VITALITE

SMARTPHONE AND COOK STOVE ADD-ONS FOR PAYG SOLAR HOME SYSTEMS

LOCATION
Zambia

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity / Mobile Services

airtel MTN

PROBLEM

In Zambia, more than 83% of the population relies on costly and dirty solid fuels for cooking.[102] Using solid fuels for cooking is not only bad for the environment, but can also pose severe health risks that reduce life expectancy.

SOLUTION / PROJECT

VITALITE Zambia, founded in 2013, is a PAYG solar home system, cook stove and agriculture solutions provider in Zambia.

In October 2017, VITALITE received a grant from the GSMA M4D Utilities Innovation Fund to trial smartphone and cook stove add-on products for its PAYG SHS in Zambia. The project aims to leverage the PAYG mechanism to deploy 1,500 smartphones and 500 cookstoves across rural areas of Zambia. VITALITE partners with Zambia's two leading mobile operators, MTN and Airtel, to allow the start-up to rely on mobile money for payments.

LOOKING AHEAD

As of October 2018, VITALITE has sold 739 add-on products (438 smartphones and 301 cook stoves), impacting nearly 2,000 beneficiaries. It aims to reach over 4,000 beneficiaries by the end of the grant in July 2019. Over 30% of VITALITE customers are using mobile money to pay for the products.

ENERGY

ORANGE MADAGASCAR

SOLAR HOME SYSTEMS FOR RURAL ELECTRIFICATION LED BY A MOBILE OPERATOR

LOCATION
Madagascar

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity / Mobile Services

PROBLEM

Only 22% of the population in Madagascar has access to electricity,[103] and this rate is even lower in rural areas. People often have to rely on poor quality and unclean fuels like kerosene and diesel to meet their energy needs.

SOLUTION / PROJECT

In Madagascar, **Orange** has a mobile connection base of nearly two million as of the end of 2018.[104]

In October 2017, Orange Madagascar received a grant from the GSMA M4D Utilities Innovation Fund to launch PAYG solar home systems leveraging the Orange brand in partnership with d.light, a supplier of SHS products. The energy offering is expected to provide electricity access to underserved households around Antananarivo, the northern and western areas of Madagascar. Orange had initially prioritised launching its services in the central region, but in November 2018 expanded the launch to the north region in line with the grant proposal.

ORANGE BURKINA FASO

SOFTWARE-AS-A SERVICE SMART METERING SOLUTION LED BY A MOBILE OPERATOR

LOCATION
Burkina Faso

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity / Mobile Services

PROBLEM

Only 19% of the population in Burkina Faso has access to electricity and in rural areas this rate is less than 1%.[105]

SOLUTION / PROJECT

In Burkina Faso, **Orange** is the largest mobile operator with a mobile connection base of over eight million as of the end of 2018.[106]

In October 2017, Orange Burkina Faso received a grant from the GSMA M4D Utilities Innovation Fund to pilot prepaid smart metering on mini-grids in partnership with SINCO, a cooperative that manages electricity distribution through rural grids. This smart metering, software-as-a-service solution aims to enable SINCO's customers to manage their energy expenditure. The smart meter solution leverages mobile money, M2M connectivity, SMS and other mobile technologies. Orange also has an online, real-time dashboard synced with each meter to monitor fraud, alarms, disconnection and usage.

LOOKING AHEAD

Orange is currently using mobile payments for postpaid services and intends to add prepayment integration with mobile money soon.

AFGHAN WIRELESS COMMUNICATION COMPANY

LEASE-TO-OWN SOLAR HOME SYSTEMS LED BY A MOBILE OPERATOR IN A GREENFIELD MARKET

LOCATION
Afghanistan

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity / Mobile Services

PROBLEM

For many decades, the electric grid in Afghanistan has been significantly disrupted by conflict. Although 84% of the Afghan population has access to electricity, power cuts are very frequent.[107]

SOLUTION / PROJECT

The **Afghan Wireless Communication Company** (AWCC) is a mobile operator in Afghanistan with a mobile connection base of over nearly five million as of the end of 2018.[108]

In May 2018, AWCC received a grant from the GSMA M4D Utilities Innovation Fund to launch PAYG solar home systems to provide new energy services to residents of Afghanistan without any access to reliable energy. AWCC has partnered with SHS manufacturer d.Light for this project and intends to expand energy access in Afghanistan while also driving mobile penetration.

LOOKING AHEAD

Following the pilot funded by the GSMA grant in Kabul and Kandahar, AWCC plans to maximise its distribution and agent network to offer other utility services beyond energy.

ENERGY

BRIGHTERLITE

PIONEERING SOLAR HOME SYSTEMS IN MYANMAR

LOCATION
Myanmar

USE OF MOBILE CHANNELS
Mobile Payments / Mobile Services

PROBLEM

National energy access in Myanmar stands at 57% and is worse in rural areas where only 40% of residents have access to energy.[109]

SOLUTION / PROJECT

Brighterlite, founded in 2012, provides solar home systems on a PAYG basis in Asia. In May 2015, Brighterlite received a grant from the GSMA M4D Utilities Innovation Fund to launch its SHS in Myanmar with Telenor Myanmar as a mobile operator partner.

Despite early successes, in February 2017, Brighterlite's board of directors decided to end the company's operations in Myanmar. The decision was based on a series of factors, including unclear policies regarding subsidies for SHS in Myanmar.

LOOKING AHEAD

Before EcoEnergy acquired its portfolio in November 2017, Brighterlite had collaborated with the World Wide Fund for Nature Pakistan and K-Electric, an energy utility, to deliver PAYG services in Pakistan. The initial pilot with K-Electric reached over 1,745 households, but Brighterlite was unable to scale further.

EASYPAISA

ENABLING AFFORDABLE SOLAR ENERGY IN PAKISTAN THROUGH A JOINT VENTURE

LOCATION
Pakistan

USE OF MOBILE CHANNELS
Mobile Payments / Mobile Services

PROBLEM

In 2012, Pakistan had an electrification rate of 69%, with 57% access in rural areas and 88% access in urban areas. It is estimated that 144 million people (about 78%) in Pakistan who are either off-grid or experience more than 12 hours of load shedding per day.[110]

SOLUTION / PROJECT

Easypaisa is a joint initiative with Telenor Pakistan, the country's second largest mobile network operator, and Tameer Microfinance Bank, the country's largest microfinance bank. Easypaisa leverages key operator assets, such as the cellular data network, mobile money service, distribution network and knowledge of customers' historical mobile usage to extend solar power services.

In January 2014, Easypaisa received a grant from the GSMA M4D Utilities Innovation Fund to trial this solution in two regions of Pakistan. Easypaisa collaborated with two vendors, Roshan Energy in Sindh and Brighterlite Pakistan in Punjab, KPK and Sindh, to test the two PAYG business models.

LOOKING AHEAD

Over 1,500 SHS were sold or rented by March 2016, well above the target of 125 under the grant-funded project. Thanks to mobile payments, Easypaisa agents increased their transaction volumes significantly. In underserved urban areas, one Easypaisa agent saw an increase from three to four money transfer transactions per day to 18 to 20.

MOBILE4ENERGY

NABLING MOBILE OPERATORS' EXISTING PREPAID BILLING AND COLLECTIONS INFRASTRUCTURE FOR ENERGY PROVISION IN RURAL KENYA

LOCATION
Kenya

USE OF MOBILE CHANNELS
Mobile Payments / M2M Connectivity

PROBLEM

While electrification in Kenya has grown to cover 50% of the population,[111] many people in reach of the grid are still not connected.[112]

SOLUTION / PROJECT

Mobile4Energy sought to work with the Rural Electrification Authority (REA) in Kenya to construct a mini-grid extension to a community near the grid, but with limited connections. It planned to buy power from the grid wholesale and sell to households through a mini-grid, while providing customers with prepaid smart metering supported by Airtel for payments using airtime scratch cards.

In May 2015, Mobile4Energy received a grant from the GSMA M4D Utilities Innovation Fund to develop and deploy a mobile-enabled turnkey meter-to-cash solution for utilities supporting rural electrification in Kenya. Mobile4Energy had hoped to showcase this as a solution for utilities to use mobile operators' existing billing systems.

LOOKING AHEAD

Mobile4Energy made some initial progress with Airtel designing the payment system, but could not finalise plans with REA to extend the grid and operate a parallel mini-grid. Mobile4Energy was a consortium of organisations that did not continue working on this.

Glossary

ARPU	**Average Revenue Per User** is the total recurring (service) revenue generated per mobile connection per month in the period.
GSM	**Global System for Mobile** communications is a 2G circuit-switched network based on Global System for Mobile Communications (GSM) standards developed as a replacement for the first generation analog networks, ideal for the delivery of voice but with limitations for accessing data services.
ICT	**Information and Communications Technology**
IoT	**Internet of Things** refers to the coordination of multiple machines, devices and appliances connected to the Internet through multiple networks (cellular, short range, fixed etc.). This includes M2M-enabled devices and machines (as described above) as well as everyday objects such as smartphones, tablets and consumer electronics.
LPWA	**Low Power Wide Area** networks are designed for IoT applications that have low data rates, require long battery lives, are low cost, and operate in remote and hard to reach locations, they will be easy to deploy across a number of different verticals such as utilities, smart cities, logistics, agriculture, manufacturing, and wearables
M2M	**Machine-to-Machine** technology connects machines, devices and appliances wirelessly via a variety of communications channels, including IP and SMS, to deliver services with limited direct human intervention. The devices become intelligent assets, offering a range of possibilities for improving how businesses operate.
NRW	**Non-Revenue Water** includes physical and commercial losses from infrastructural problems (such as leaking pipes) or commercial issues, such as incorrect billing, faulty meters and illegal connections to water networks
PAYG	**Pay-As-You-Go** or prepaid services allow the customer to pay in small instalments depending on the amount of services used. Mobile technologies (or channels) underpin the PAYG model in three main ways: - enable payment collection through mobile money or other forms of mobile payment; - update and control PAYG-enabled assets or services through M2M (long range technology such as GSM, or shorter range, such as Zigbee) or keypad; - enable communication between service providers, customers and local agents through mobile devicesand services such as SMS or mobile apps.
SHS	**Solar Home Systems** are typically solar lighting kits including systems from 4W to 200W+ (either under a lease-to-own and solar-as-aservice model) through our grantees and other players.
SIM	**Subscriber Identity Module** is an integrated circuit that is intended to securely store the international mobile subscriber identity (IMSI) number and its related key, which are used to identify and authenticate subscribers on mobile telephony devices (such as mobile phones and computers).

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