

Mobile for Development Utilities

Unlocking access to utility services: the transformational value of mobile

MAY 2016

The GSMA represents the interests of mobile operators worldwide, uniting nearly 800 operators with almost 300 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 industry-leading events such as Mobile World Congress, Mobile World Congress Shanghai and the Mobile 360 Series conferences.

For more information, please visit the GSMA corporate website at www.gsma.com

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Mobile for Development Utilities

The Mobile for Development Utilities Programme promotes the use of mobile technology and infrastructure to improve or increase access to basic utility services for the underserved. Our programme focuses on any energy, water or sanitation services which include a mobile component such as mobile services (voice, data, SMS, USSD), mobile money, Machine to Machine (M2M) communication, or leverage a mobile operator's brand, marketing or infrastructure (distribution and agent networks, tower infrastructure). The Programme receives support from the UK Government.

The Innovation Fund

The Mobile for Development Utilities Innovation Fund was launched in June 2013 to test and scale the use of mobile to improve or increase access to energy, water and sanitation services. In two phases of funding, grants were competitively awarded to 34 organisations across Asia and Africa. Seed grants were awarded for early stage trials, Market Validation grants for scaling or replication of business models, and Utility Partnership grants to foster partnerships between utility companies and innovators.

The specific objective of the Innovation Fund is to extract insights from the trial and scaling of these innovative models to inform three key questions for growing the sector:

- How can mobile support utility services?
- For a mobile-enabled solution to be adopted at scale, what building blocks are needed?
- What are the social and commercial impacts of delivering community services to underserved mobile subscribers?

These insights, as well as grant-specific learning objectives, are included in individual case studies such as this one, as well as thematic reports that will be published throughout 2015 and 2016.

UKaid
from the British people

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Forewords

Turning a light on for your children to study, drinking safe water from your household tap, or having access to basic sanitation facilities, are all simple necessities which everyone should have access to. However, billions of people in emerging markets still lack access to these essential utility services.

Mobile represents a powerful opportunity to address this gap and make meaningful contributions to the UN's Sustainable Development Goal 6, ensuring access to water and sanitation and Goal 7, ensuring affordable energy for all. Through its numerous channels - not least mobile money, machine-to-machine communications and mobile services - mobile technology can improve and increase access to these basic utility services, stimulating markets, empowering small businesses and, crucially, saving lives.

Thanks to funding from the UK Department for International Development, the M4D Utilities programme's Innovation Fund supports organisations trialling new mobile-enabled business models for energy, water and sanitation services, impacting nearly 2 million people to date.

We hope this report demonstrates the significant expansion and innovation we are seeing in mobile-enabled utility products and services, and that the lessons shared contribute to further scaling and sector growth. The GSMA will continue to play a pivotal role in ensuring that the mobile industry positively impacts the lives of the underserved, while creating commercially sustainable partnerships, so that we can look forward to a world where everyone has access to basic utility services.

Mats Granryd,



Director General GSMA

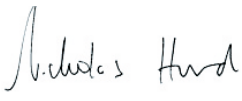
Mobile technology has the potential to help provide the poorest people across the world with basic services. Since 2012, the UK Department for International Development (DFID) and the GSMA have been working together to use this technology to improve access to clean energy, water and sanitation.

Mobile phone subscription is expanding dramatically; almost half of the people who do not have access to electricity do have mobile coverage. DFID and the GSMA will use the availability of mobile phone technology, and the reach of mobile network operators, to help achieve the ambitious Global Goal targets of universal and equitable access to affordable, reliable and safe energy, water and sanitation by 2030.

The Mobile for Development Utilities programme was an early supporter of innovation in this area and it has already benefited over 1.9 million people. By providing seed funding to 34 early stage technologies it has, to date, leveraged over USD 58 million of private sector funding. The programme has proven that using mobile technology works; grantee Mobisol received a Market Validation grant in 2013 to replicate its Pay-as-you-go solar business from Tanzania to Rwanda. Since then it has provided over 250,000 people with clean solar energy to power key household appliances. This means people can power lanterns - allowing children to continue their studies after school - and charge phones for neighbours, which can earn families an average of 35 USD per month. Mobisol has drawn in significant additional funding to expand its business model, and has now begun operations in Kenya while creating a total of 800 jobs since 2013.

The evidence base showcased in this report can be used by mobile operators, academics, entrepreneurs, governments, and investors alike to grow and scale the sector to the next level of maturity. We welcome you to utilise these insights, join us and engage in this innovative and thriving space.

Hon Nick Hurd MP



UK Department for International Development

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Executive Summary

The mission of the GSMA's Mobile for Development (M4D) Utilities Programme is to unlock commercially sustainable business models that leverage mobile to deliver energy, water and sanitation services to underserved communities, thus helping to achieve United Nations' Sustainable Development Goal 6 and Goal 7.

The programme focuses on rural, decentralised utility services as well as urban and peri-urban, centralised utility services.

This Annual Report describes the work done, lessons learned and challenges that remain to be solved before the potential of mobile to accelerate access to energy, water and sanitation, can be fully realised.

Since its inception in 2013, our programme has awarded grants to 34 organisations offering mobile-enabled utility services in 21 markets. It has engaged with mobile network operators (MNOs) in six markets to support these MNOs to develop solutions for the utilities sector. Together, these engagements have combined to give us a unique opportunity to examine the mobile-enabled utility sector in depth. These insights, alongside numerous meetings with key ecosystem players, we have identified the following emerging trends:

Mobile is unlocking rapid growth of PAYG utility services

Approximately 650,000 mobile-connected pay-as-you-go (PAYG) solar home systems (SHSs) have been delivered worldwide, with over 30 companies operating in at least 32 countries. Mobile channels are enabling this and other prepaid/PAYG models to flourish, attracting significant investments in the PAYG energy sector and new business models to emerge in the water sector.

The Internet of Things is transforming utility models

The Internet of Things (IoT) is already key to some off-grid energy models and, soon, connected infrastructure might change the landscape for centralised and decentralised utility systems, with several pilots already underway.

Challenges remain in powering telecom towers as an anchor business for community power

Off-grid energy companies, particularly microgrid providers, may seek to anchor their businesses to powering telecom towers—a viable way to power surrounding businesses and communities. Community Power from Mobile (CPM) models are seeing traction in some markets, but aligning the incentives of all parties remains a challenge.

Steady expansion in distribution and branding partnerships with MNOs

Leveraging the distribution networks of MNOs remains somewhat challenging, but can yield significant value for both utility service providers and MNOs, particularly through co-branding.

Mobile-enabled water services are advancing while sanitation models are still nascent

Water and sanitation businesses have grown more slowly than those in the energy sector, but there are signs that information about service delivery and new payment mechanisms are supporting business models and government partnerships, and that mobile could play a role in improving access to sanitation.

Partnerships with MNOs are growing

Many of our grantees have partnered to leverage MNO assets such as mobile payment platforms or sales outlets to enhance their efficiency, extend their reach and offer new services. These partnerships, although not between equals, are often symbiotic, with the MNO benefitting from increasing uptake of mobile services and improved brand perception. Furthermore, with the growing appreciation of the opportunity, some MNOs are taking the lead in utility services. For example, Dialog Axiata and Telenor Pakistan are leading efforts to improve energy access in their respective countries.

Investment in PAYG energy is accelerating

The market opportunity for energy, especially PAYG energy, has also attracted the attention of investors with nearly USD 295 million being awarded to PAYG energy companies so far, mainly in Africa. However, the success in attracting private capital into the water and sanitation sectors is much slower, highlighting the continued critical role of grants in funding innovative business models, where the risk of investing in early stage enterprises remains high.

PROGRAMME IMPACT
2013-2015

KEY FIGURES

34 organisations awarded grants

10 Case Studies published

21 Energy

11 Water

2 Sanitation

GBP **2,589,784** committed in Phase 1 grants

GBP **3,426,470** committed in Phase 2 grants

PHASE 1 GRANTS LED TO

GBP **40,500,000** raised to date by grantees in private sector investment

FUNDED PROJECTS AND STUDIES IN

24 COUNTRIES



1 Feasibility study for NCell

2 Feasibility studies from Etisalat

3 Feasibility studies from Orange

DIRECT BENEFICIARIES

1,997,002

81,752

1,914,365

855

1 Introduction

The GSMA Mobile for Development Utilities programme (formerly Mobile Enabled Community Services or MECS) was launched in 2013, with the support of the UK Department for International Development (DFID), to explore the role of mobile technology and infrastructure in increasing and improving access to basic energy, water, and sanitation services in underserved urban and rural communities.

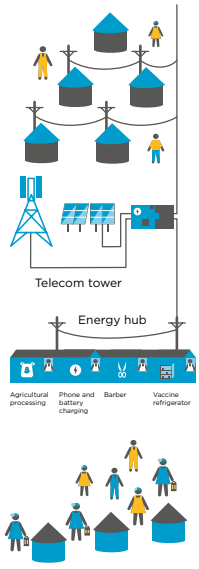
The Mobile for Development (M4D) Utilities programme has identified five mobile channels through which access to energy, water, and sanitation can be improved.

Mobile channels for utility services

Mobile infrastructure

The telecom tower acts as the anchor load for the energy service company (ESCO) that also supplies energy to surrounding communities via a microgrid and/or energy hub model.

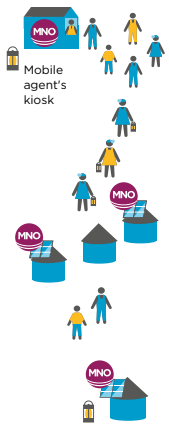
Microgrid



Sales, distribution and branding

The extensive footprint of mobile network operators' sales and distribution channels together with their recognisable and trusted brand can be leveraged to reach underserved customers with energy, water and sanitation solutions.

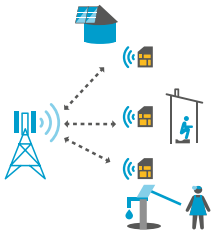
Leveraging MNOs' sales, distribution and branding



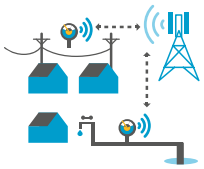
Machine-to-machine connectivity

Smart metering and monitoring of utility systems over GSM networks improves their lifetime and efficiency, triggers more responsive maintenance and repair, and provides insights into customer behaviour. It also enables on/off control of services to customers on a Pay-as-you-go (PAYG) arrangement.

Metering and monitoring of decentralised utility services



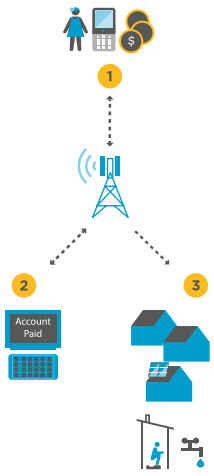
Smart metering and monitoring of grid energy and piped water services



Mobile payments

Mobile payments (mobile money services, SMS payments, airtime) can enable the development of PAYG models and other innovative financing schemes. In addition to supporting remote and secure collections, mobile payments are also can also create a digital record of payments, for those without a prior credit history.

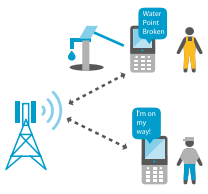
Mobile payments for energy, water and sanitation products and services



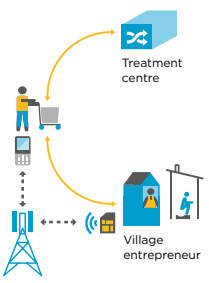
Mobile services

Mobile services (voice, SMS, USSD, apps) can be used by communities, village agents, and service providers to report service delivery status, improve field operations, optimise supply chains, or provide customer support.

Two-way communication platform to collect and disseminate critical utility systems information



Optimise supply chain logistics with SMS, USSD and mobile web platforms



This Annual Report shares the key insights and trends we have gleaned from close engagement with mobile network operators (MNOs) and grantees of our programme, as well as from research and convening stakeholders in the utility sector. The report demonstrates the increasingly important role of mobile in improving the delivery of essential services to the underserved, and the increasing viability of the business models currently being implemented.

This report covers three areas: trends, MNO collaboration and funding.

- **Trends -** In addition to identifying trends in the broader mobile sector, we point to lessons from the first 13 grants awarded under the Innovation Fund,[1] now complete, and some early lessons from the 21 grants awarded at the end of 2015.

- **MNOs -** Section 3 of this report describes our continued engagement with MNOs, beyond the Innovation Fund, to identify opportunities in MNOs' markets and contribute additional evidence to support the business case for entering into partnerships with utilities service providers. Our engagement with Ncell in Nepal is proof of the value of such engagement, with Ncell partnering with Gham Power to extend energy and mobile services into off-grid areas of Nepal.

- **Funding -** A total of 385 organisations with high-quality business models applied to the Innovation Fund, indicating significant demand for funding. The fund was 11 times oversubscribed with applicants requesting a total of GBP 61 million in grants, demonstrating the untapped demand for additional risk capital to support early innovators. The opportunity in the mobile-enabled energy sector is being seized by investors, with nearly USD 295 million being awarded to PAYG energy companies so far, mainly in Africa. This is, in part, due to innovative utility service models that are increasingly using machine-to-machine (M2M) connectivity for remote monitoring and control. This allows service providers to exercise control over repayment and gather rich usage data which can enable further lending as well as upselling. However, the success in attracting private capital in the water and sanitation sectors is much slower, highlighting the critical role grants must continue to play in funding innovative business models, where the risk of investing in early stage enterprises remains high.

1. Mobile for Development Utilities Innovation Fund: http://www.gsma.com/mobilefordevelopment/programmes/m4dutilities/innovation-fund-2

How the mobile industry can enhance access to energy, water, and sanitation services

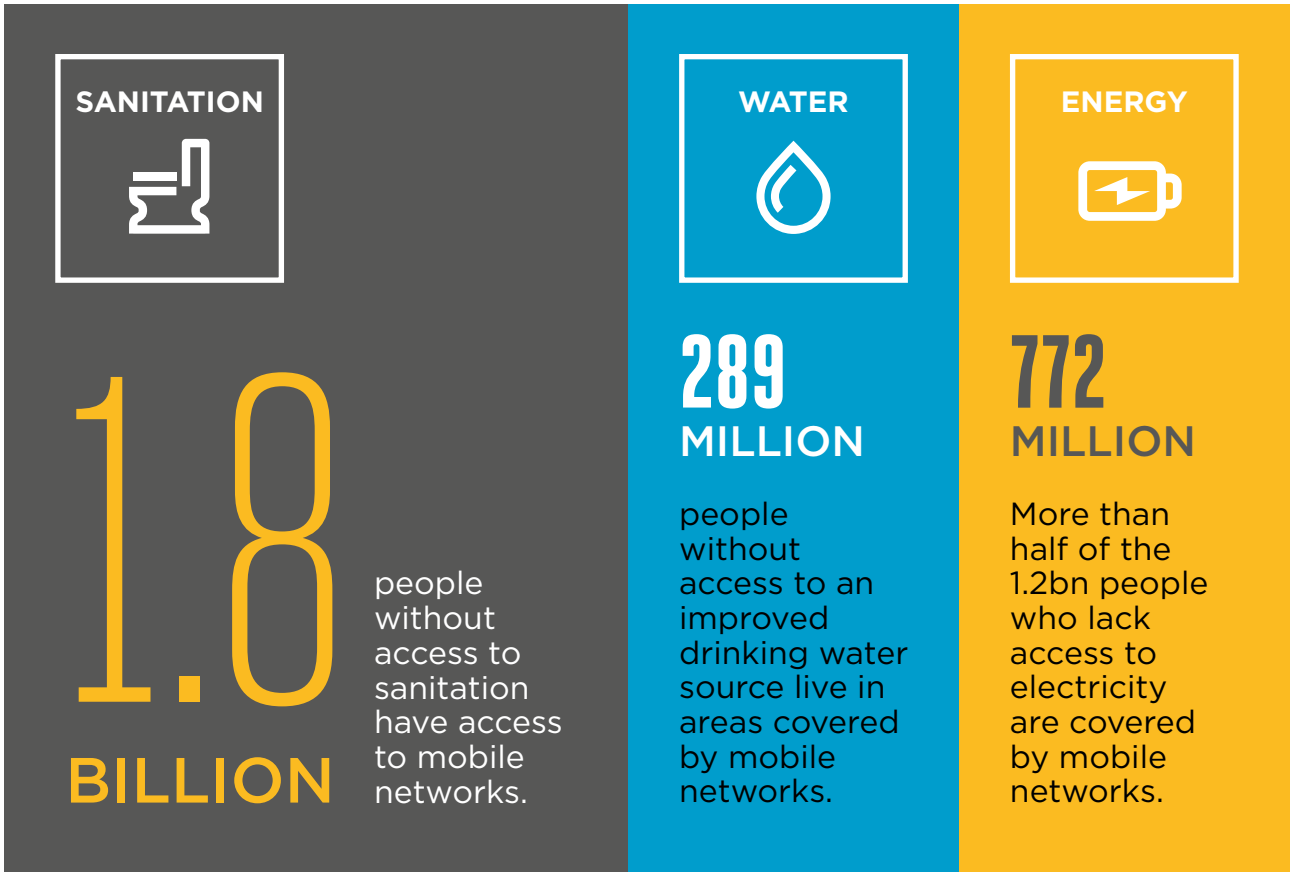
GSMA is supporting the role of MNOs in achieving United Nations Sustainable Development Goals (SDGs) in emerging markets. Our programme focuses specifically on ensuring access to water and sanitation (Goal 6) and ensuring affordable energy for all by 2030 (Goal 7).

The reach of mobile connectivity is greater than the reach of basic utility services like electricity or improved water and sanitation services, creating a new technological pathway to improve access to utility services for underserved communities.

Improving access to energy, water, and sanitation in turn improves health, education, income, and many other areas which enhance the lives of underserved people. The challenge is daunting, as indicated by the vast number of people still lacking access to basic utility services (see Figure 1), and for millions more whose only choice is to use unsafe or inconvenient resources. However, the M4D Utilities programme is proving there is a substantial opportunity for the mobile industry to help solve these challenges, while also growing their businesses.

FIGURE 1

SDGs and the utility gap in numbers



Our journey so far

M4D Utilities programme areas

To close the access gap to basic utility services, our programme focuses on the following areas:

1. **Knowledge sharing and convening:** Raising awareness, identifying best practices, and building practitioner partnerships by hosting stakeholder working groups and disseminating research and Case Studies

2. **Advisory services:** Conducting Feasibility Studies and creating tailored tools for MNOs to further evidence of the business case for them to enter into partnerships

3. **Innovation Fund:** Seeding growth and sharing lessons that support the sector through grants for trialling and scaling mobile-enabled utility service models

4. **Market building:** Developing relationships with private and public funders, and working with them to address issues that limit future grant and commercial funding to support the growth of the industry.

Our programme has evolved quickly alongside the maturing mobile-enabled utility sector (see Programme Timeline). Since our last Annual Report[2] we have:

- Expanded our scope to include sanitation services and added a new grant type to specifically support partnerships between providers of technology solutions and traditional urban utilities;

- Completed 13 grants and issued 21 new grants to trial innovative business models for mobile-enabled energy, water and sanitation services;

- Published grantee Case Studies to share lessons with the broader industry;

- Established a community of operators and practitioners, hosting five working groups with XX attendees;

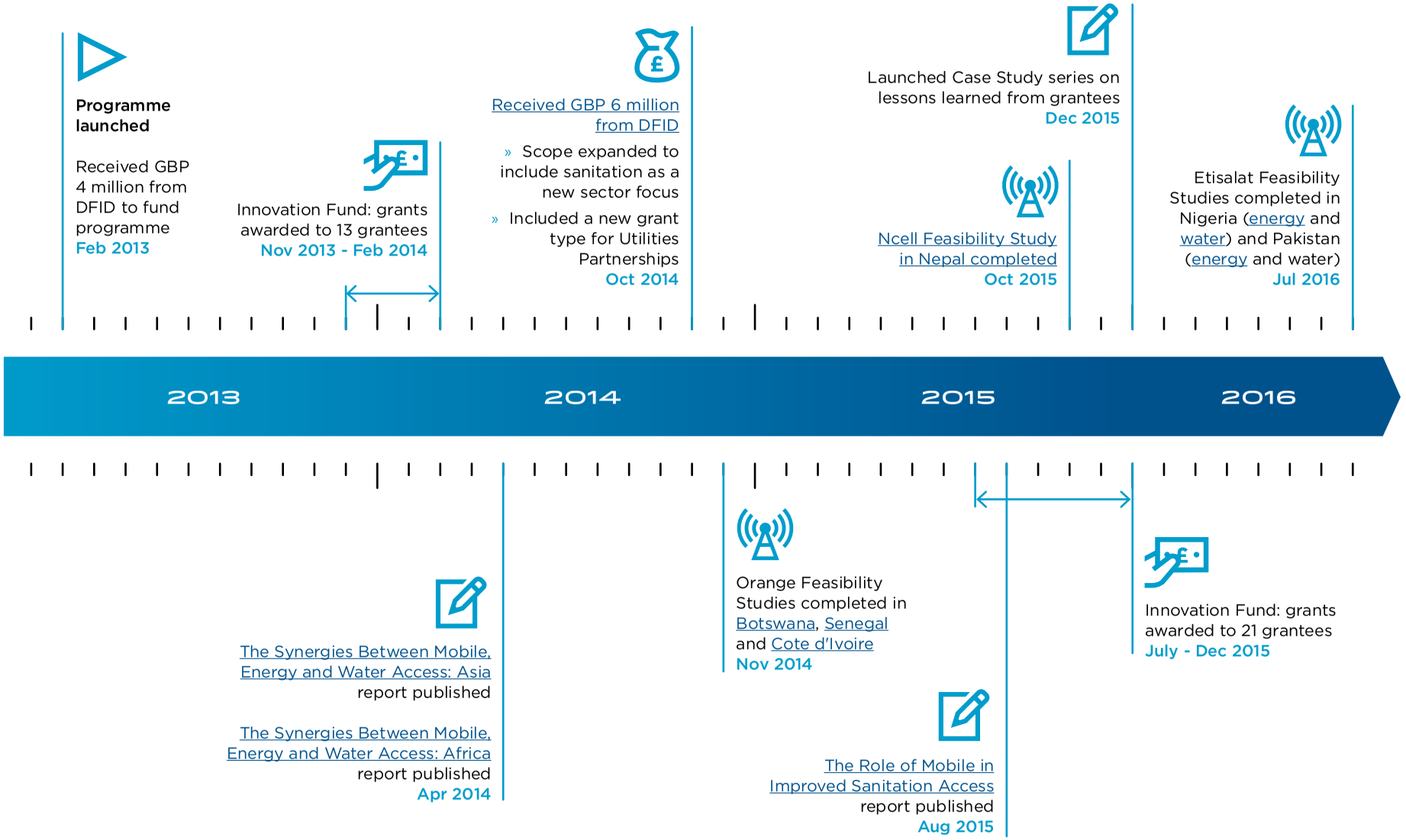
- Undertaken Feasibility Studies with four MNOs in six markets (see map); and

- Secured funding from the DFID for Phase 3 of the M4D Utilities Programme.

2. GSMA Mobile Enabled Community Services (MECS) Programme, May 2014, "Predicting the future of mobile-enabled community services", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2014/05/GSMA_MECS_Annual-Report-2013.pdf

Source: GSMA

The M4D Utilities programme journey



Geographical spread of M4D Utilities grantees



Programme impact

The innovative trials we have funded are already having an impact on nearly two million lives. Some of the projects have proven to be commercially viable, with grantees with PAYG business models raising GBP 40.5 million from investors. At the same time, there has been significant investment in the energy sector, particularly in PAYG services, which have seen more than USD 260 million invested in 2014 and 2015 alone (see Section 4). Although the mobile-enabled water and sanitation sectors are more nascent, we are supporting 13 grantees in these sectors and have already seen some promising models, impacting 1.9 million direct beneficiaries.

Looking ahead

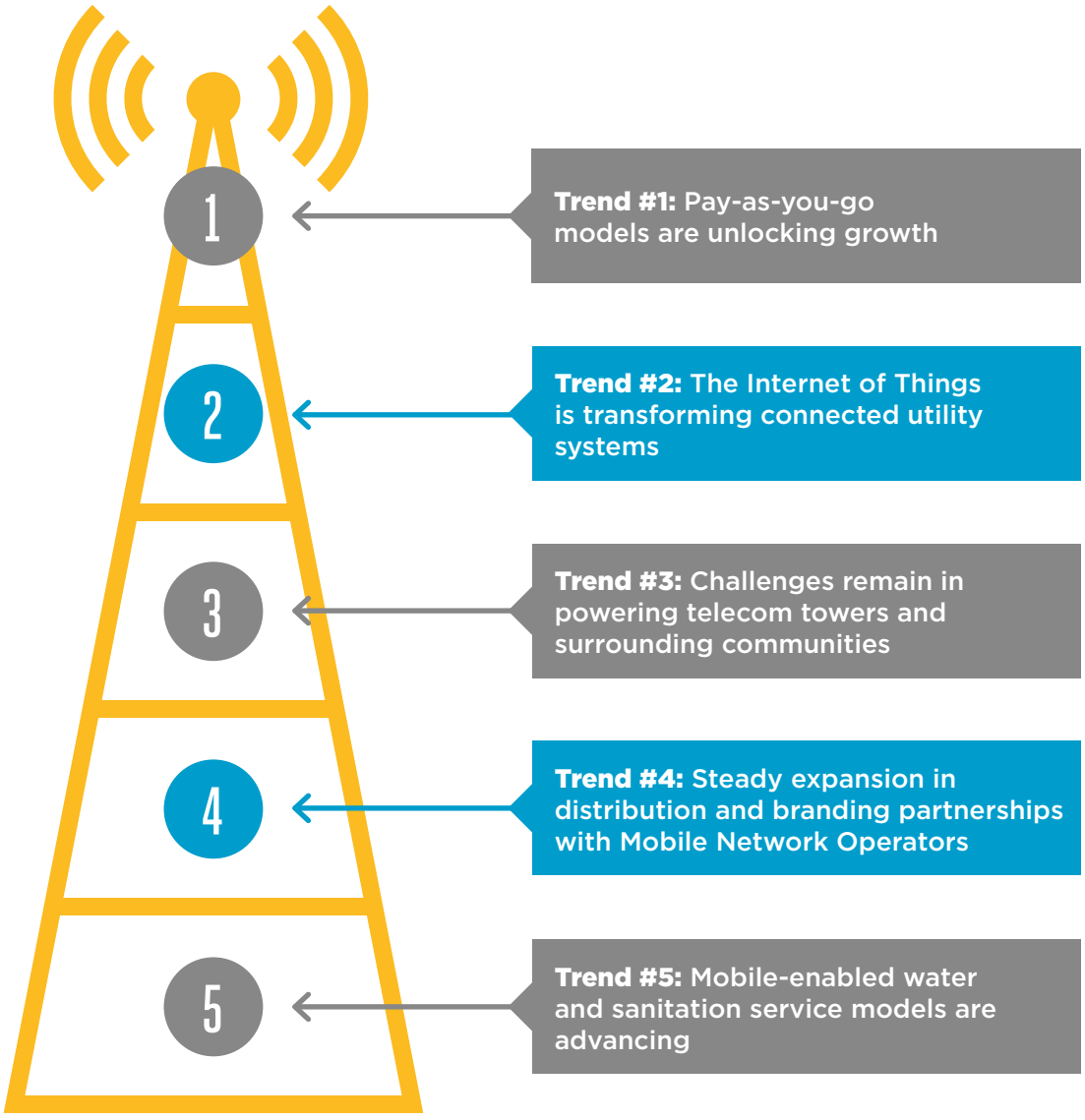
In 2017, our Phase 2 grantee projects will come to a close, and we will be sharing the lessons of these early stage companies as we go, ensuring that we continue to shape the industry.

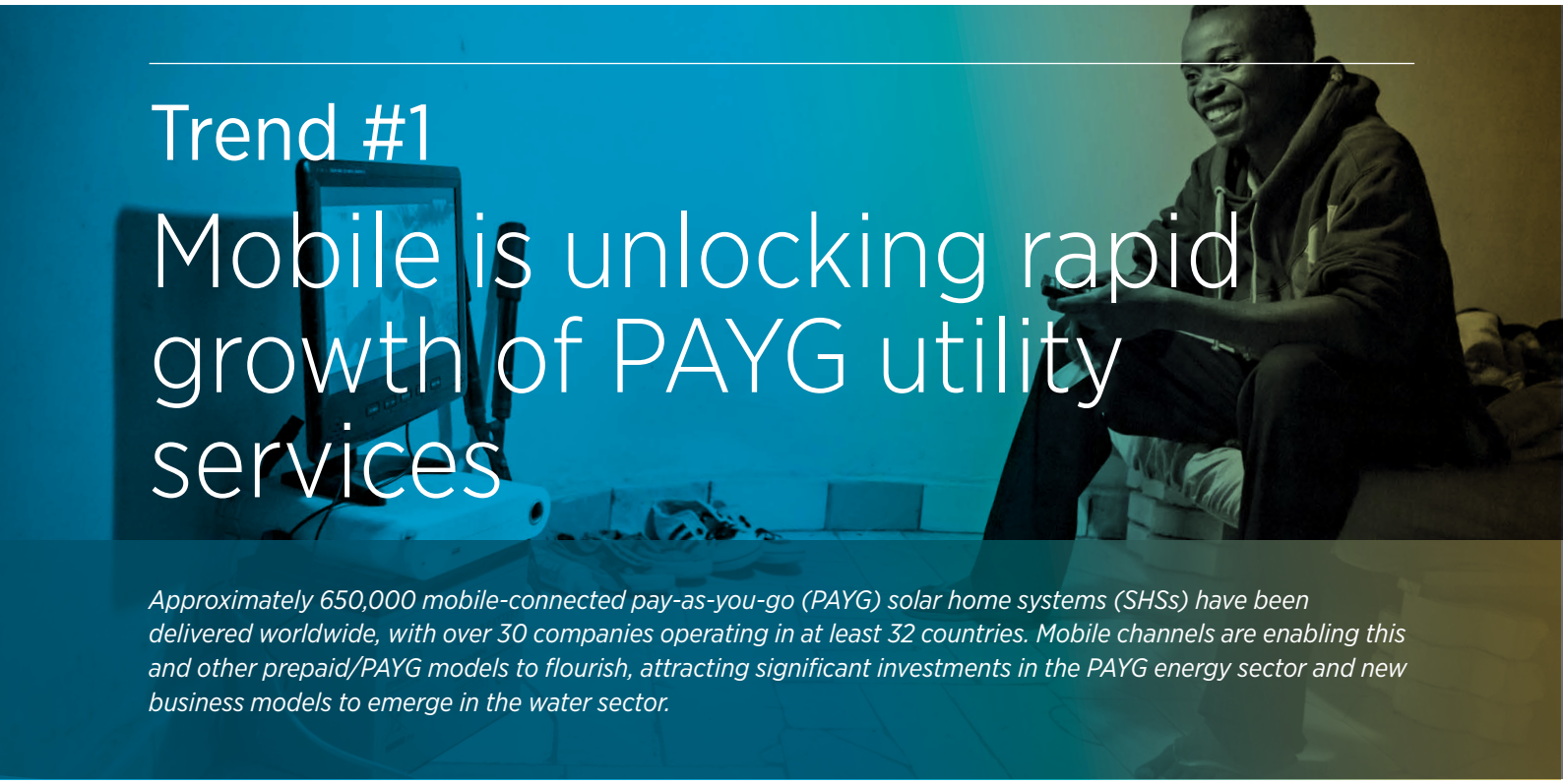
We are currently working on the scope of our next phase of work. As this new phase of the M4D Utilities programme is developed, we welcome your views on areas that we should focus on. Please email us at M4DUtilities@gsma.com

2 Emerging trends in mobile-enabled utilities

FIGURE 2

Emerging trends in the mobile-enabled utility sector





Trend #1
Mobile is unlocking rapid growth of PAYG utility services

Approximately 650,000 mobile-connected pay-as-you-go (PAYG) solar home systems (SHSs) have been delivered worldwide, with over 30 companies operating in at least 32 countries. Mobile channels are enabling this and other prepaid/PAYG models to flourish, attracting significant investments in the PAYG energy sector and new business models to emerge in the water sector.

Mobile channels underpin the PAYG model in two ways: they enable payment collection through mobile money or other forms of mobile payment, and they update and control PAYG-enabled assets or services through M2M or mobile services, such as SMS or mobile apps.[3]

Across sectors, mobile-enabled PAYG meets important needs for both customers and service providers. On the customer side, it is affordable and convenient for those with irregular incomes. PAYG expands the addressable market significantly and, in some cases, builds consumer trust by offering a low-risk, low-commitment trial.[4] This is especially important in areas where low-quality solar products may have damaged user perceptions and opinions of the service. For service providers, PAYG allows more efficient and secure payment collection, digital payment records, and gives customers an incentive to pay regularly since the service is suspended if they default.

MNOs have both enabled and benefitted from mobile payments for PAYG services. In December 2015, Fenix International, an SHS provider and Phase 1 grantee,[5] was the third largest MTN Money bill pay account by volume in Uganda, with 13% of Fenix's customers new to mobile money. In January 2016, fellow grantee and SHS provider, Mobisol,[6] generated USD 0.58 in monthly transaction fee revenues to MTN Rwanda per entrepreneur. Entrepreneurs made an average of 5.1 mobile money payments every 90 days, and 20% were new to mobile money. By providing a compelling use case for mobile money, these PAYG providers are driving mobile money penetration and usage, providing key benefits for their MNO partners. Telenor Pakistan, another Phase 1 grantee, successfully trialled the sale of PAYG SHSs through its retail network, with payments collected over its mobile money service, Easypaisa. Telenor is now working towards integrating SHSs into its portfolio. Devergy, a Phase 2 grantee, proposes to integrate MNO and energy services even more closely by offering a mobile and energy bundle to Tigo customers in rural Tanzania. The results of this project will be available in the first half of 2017.

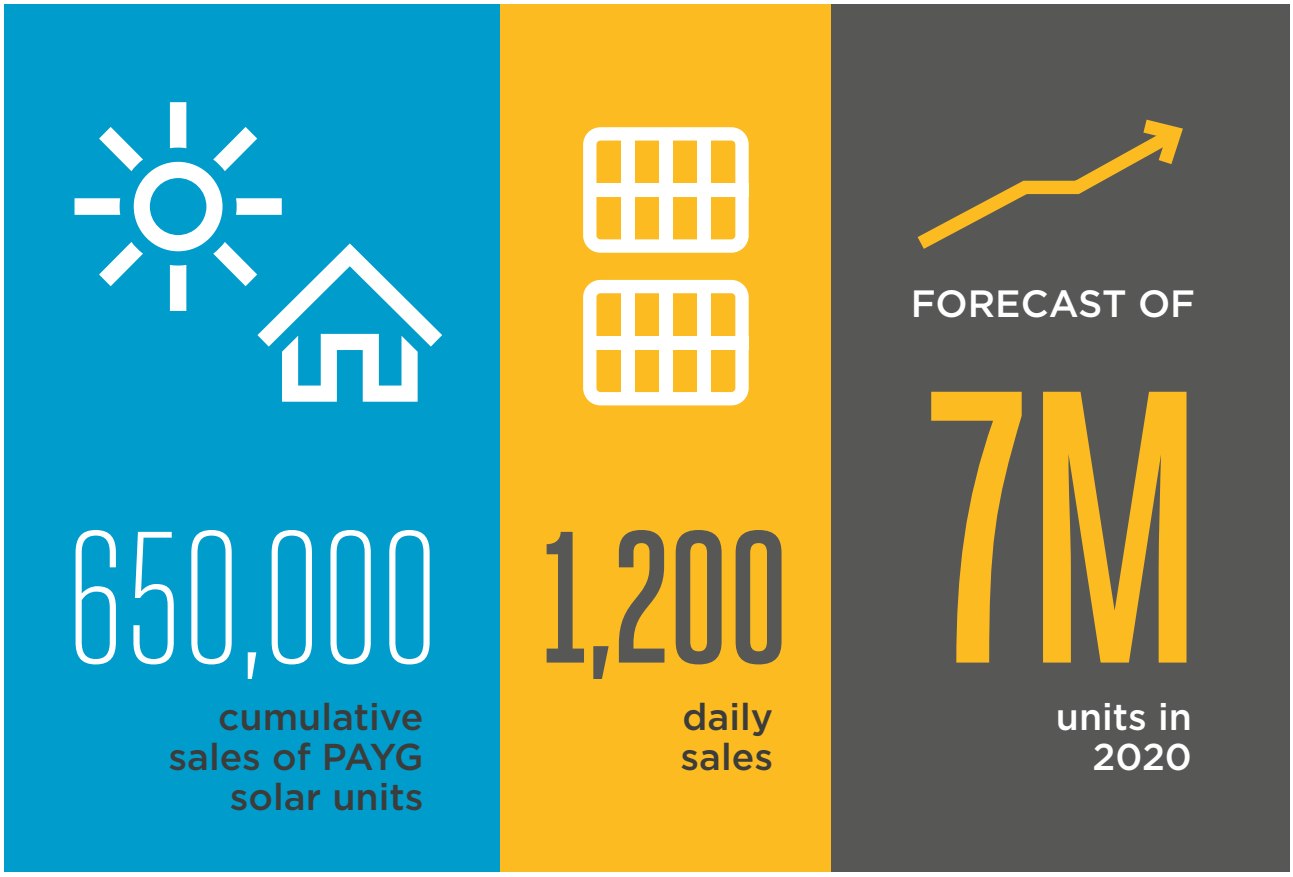
3. For an in-depth examination of PAYG, see GSMA Mobile for Development Utilities programme, January 2016, "Assessing the opportunity for pay-as-you-go solar in Nigeria", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/02/GSMA_Etisalat_PAYG_Final-20160211.pdf
4. GSMA Mobile for Development Utilities programme, May 2016, "Kamworks: Introducing GSM-enabled PAYG solar in Cambodia", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/05/M4D-Utilities-Grantee-Case-Study-Kamworks.pdf
5. GSMA Mobile for Development Utilities programme, December 2015, "Fenix International: Scaling pay-as-you-go solar in Uganda", http://www.gsma.com/mobilefordevelopment/programme/m4dutilities/fenix-international-scaling-pay-go-solar-uganda
6. GSMA Mobile for Development Utilities programme, January 2016, "Mobisol: Pay-as-you-go (PAYG) solar for entrepreneurs in Rwanda", http://www.gsma.com/mobilefordevelopment/programme/m4dutilities/mobisol-pay-as-you-go-payg-solar-for-entrepreneurs-in-rwanda

Pay-as-you-go continues to gain strength in the energy sector

The strong growth of PAYG business models has continued in the off-grid solar energy sector. Over half of the 116 energy-related Concept Notes submitted in Phase 2 of the Innovation Fund included a PAYG model.[7] According to Bloomberg New Energy Finance (BNEF) and Lighting Global, PAYG solar unit sales currently account for less than 2% of the off-grid solar market, but are growing rapidly, with sales doubling in the first nine months of 2015.[8] Our estimates, based on data from the largest five PAYG providers, Mobisol,[9] M-KOPA,[10] Fenix[11] (all three Phase 1 grantees), Azuri Technologies[12] and Off-Grid Electric,[13] put cumulative total sales at 650,000 with an estimated 1,200 sales per day. Annual PAYG solar unit sales are forecast to reach 13% of the off-grid solar unit market in 2020, which represents 7 million units.[14]

FIGURE 3

PAYG solar unit sales



7. GSMA Mobile for Development Utilities programme, January 2016, "Emerging trends in mobile enabled utility services," http://www.slideshare.net/GSMA_Mobile4Development/emerging-trends-in-mobile-enabled-utility-services
8. BNEF and Lighting Global, 2016, "Off-grid solar market trends report 2016," https://www.lightingglobal.org/launch-of-off-grid-solar-market-trends-report-2016/
9. Adilya Zaripova, April 2016, "Mobisol installed 50,000 PV home systems in East Africa", PV Magazine, http://www.pv-magazine.com/news/details/beitrag/mobisol-installed-50-000-pv-home-systems-in-east-africa_100024334/
10. The Economist, 27 February 2016, "Power to the powerless", http://www.economist.com/news/international/21693581-new-electricity-system-emerging-bring-light-worlds-poorest-key
11. PC Tech Magazine, 28 April 2016, "Fenix International hits 60,000 in solar leases for its ReadyPay Power," http://pctechmag.com/2016/04/fenix-international-hits-60000-in-solar-leases-for-its-readypay-power/
12. Business Wire, 27 April 2016, "Azuri East Africa Launches As PayGo Solar Market Expands," http://www.businesswire.com/news/home/20160427005100/en/Azuri-East-Africa-Launches-PayGo-Solar-Market
13. Jonathan Moules, 3 April 2016, "Off Grid Electric lights a safer path for Tanzanians", Financial Times, http://www.ft.com/cms/s/2/569bf166-c455-11e5-808f-8231cd71622e.html
14. BNEF and Lighting Global, 2016, "Off-grid solar market trends report 2016," https://www.lightingglobal.org/launch-of-off-grid-solar-market-trends-report-2016/

Many PAYG companies enable Tier 1 and Tier 2 energy access[15] with appliances such as phone chargers, radios, TVs, and fans being bundled in addition to lights. With a long-term strategy of providing continuous service to customers, most PAYG energy companies aim to accompany their customers up the energy ladder by offering bigger systems for SHS providers, or pricing bundles especially for appliances for microgrid operators. For instance, Kamworks, a Phase 1 grantee, found that three-quarters of its customers preferred the largest SHS, with half of those surveyed reporting they had purchased appliances, in most cases a flat-screen LED TV. Microgrid providers have been focused on this strategy from the outset, looking for a longer term return on investment as customers use more appliances.

TEXT BOX 1

PAYG microgrids

PAYG energy providers deploying microgrids include Devergy and ME SOLshare, both Phase 2 grantees. Both projects use GSM-enabled M2M for gateway-to-server communications and mobile money payments. Devergy is installing PAYG microgrids in rural Tanzania and, in addition to a starter kit consisting of two LED bulbs and a mobile handset charger, it offers the option of a 5V DC radio, stereo system, and a DC TV from d.light.

ME SOLshare is creating DC nanogrids in Bangladesh by connecting households to an energy trading network. Households with an SHS can either buy energy or sell their excess energy, while those without an SHS can only buy energy from the grid. Each subscriber household is equipped with an M2M-enabled meter that tracks and nets the value of the purchase and sale. Subscribers use mobile money to pay for or cash out credits. ME SOLshare was one of the winners of the Outstanding Solar Project award at Intersolar Global 2016.

From a policy standpoint, there has been interest in both microgrids and minigrids. In February of this year, the government of Uttar Pradesh state, home to India's largest number of un-electrified villages, launched the first minigrid policy in the country aimed at encouraging private sector operators.[16] Meanwhile, the UK International Climate Fund is being used to support the Green Mini-Grids Africa programme. This programme aims to create the right market conditions for minigrids "to deliver IEA's estimate that over 40% of universal access to electricity by 2030 will be most economically delivered by minigrids."[17]

Several Phase 2 grantees are using PAYG to support the productive use of energy and clean cooking solutions (see Table 1).

15. Tier 1 is access to lighting and phone charging while Tier 2 covers access to lighting, air circulation, television, and phone charging. For more detailed information, see SE4all, April 2016, "Measuring energy access: introduction to the multi-tier framework", http://www.se4all.org/sites/default/files/MTFpresentation_SE4ALL_April5.PDF
16. Uttar Pradesh Mini Grid Policy 2016: http://upneda.org.in/sites/default/files/all/section/Minj%20Grid%20Policy%202016.pdf
17. Steven Hunt, Sustainable Energy for All, December 2015, "Accelerating mini-grid deployment for energy access", http://energyaccess.org/news/recent-news/accelerating-mini-grid-deployment-for-energy-access-green-mini-grids-africa-update-on-the-dfid-supported-programme/

TABLE 1

Phase 2 grantees leveraging PAYG for productive use and clean cooking

Grantee	Product or service
Village Infrastructure Angels	Productive use of energy for agro-processing at energy hubs
Gham Power	CPM model for productive use of energy, such as refrigeration, agro-processing mills, poultry incubation, and water pumping
KopaGas	LPG canister and meter for clean cooking
Mobile 4 Energy	Microgrid connections for local businesses

Another interesting way to extend the customer relationship is to refinance the initial PAYG energy product to purchase other assets, such as fuel-efficient stoves or mobile phones, or to pay school fees.[18] The incentive for regular payments stays the same, as the SHS will not work if the customer fails to make payments for the new products or services.

TEXT BOX 2

Leveraging mobile usage data for credit scoring

Just as PAYG service providers are using their customers' payment history to assess creditworthiness, MNOs could also leverage their customers' mobile usage history to derive a credit rating that could be used by PAYG providers. This is already being done for airtime loan products, which are issued based on the age of the subscriber on the network and their recharge history. Using this same principle, an MNO could use usage data, such as average revenue per user (ARPU), mobile transaction history, and geo-location to profile potential customers and better target them for its partners' PAYG services. However, telecom regulations prohibit the sharing of customer and transaction information, which has restricted this level of partnership.

The increased penetration of smartphones and internet access may finally unlock this opportunity. Mobile money apps will become more available and greatly improve the usability of mobile money services and drive adoption.[19] These apps would be able to easily obtain user consent for data sharing and could leverage handset-level data as well.[20]

18. M-KOPA, October 2015, "Lessons from M-KOPA's first three years of innovative energy service", Series: Paper 1, http://www.m-kopa.com/wp-content/uploads/2015/10/Lightbulb-series_Paper-1-2.pdf
19. GSMA Mobile Money programme, 2015, "2015 State of the Industry Report on Mobile Money", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/04/SOTIR_2015.pdf
20. Financial Times, May 2016, "Fintech takes off in Africa as lenders tap mobile technology," http://www.ft.com/intl/cms/s/0/6f5453d6-1b69-11e6-8fa5-44094f6d9c46.html

The emergence of pay-as-you-go in other sectors...

The proven success of mobile-enabled PAYG in the energy sector has led to the emergence of the model in the water sector, unlocking access to water in the same way PAYG solar has for lighting. Mobile payments have already been used successfully in the water sector, notably for utility bill payments. In Uganda, for instance, MTN reports that its mobile money service was used to collect close to RWF 118 million (approximately USD 150,000) in payments for post-paid water fees in 2015.[21]

The PAYG model could also be used with smart prepaid water meters, as CityTaps, a Phase 2 grantee, is proposing to do. In addition to improving access to centralised utility services for underserved communities, there is also an opportunity to use the mobile-enabled PAYG model for decentralised services. This will be tested by Phase 2 grantees developing innovative PAYG products and services (see Table 2). The expected lessons include how PAYG can be successfully used in areas where prepaid is already widespread but business models may not be as developed; where user willingness to pay might be lower; and where transaction amounts are sometimes so small they are either below minimum transaction threshold levels for mobile money or unviable given the transaction fees. For example, the pay-per-use charge for Phase 2 grantee Sanergy's Fresh Life Toilets[22] is KES 5, whereas the minimum transaction for mobile money in Kenya is KES 10 (note that Sanergy is not using PAYG technology). Lilongwe Water Board, another Phase 2 grantee, offers PAYG water ATMs that accept small payments via mobile money, but the transaction fees account for over 10 times the average transaction amount. The Water Board is currently in discussion with its MNO partners to either decrease the transaction fees or make them proportional, rather than a flat fee.

TABLE 2

Phase 2 grantees leveraging PAYG in water and sanitation

Grantee	Product or service	Sector
CityTaps	Smart prepaid water meters	Water
Lilongwe Water Board	Communal water ATMs	Water
Africa Water Enterprises	Rural water taps	Water
SunCulture	Solar-powered water irrigation pump	Energy, Water

21. MTN Group, 2015, Annual sustainability report, https://www.mtn.com/Investors/FinancialReporting/Documents/INTEGRATEDREPORTS/2015/sustainability-report.pdf
22. http://saner.gy

… and in other regions where mobile markets are less mature

There is a marked prevalence of PAYG, and the off-grid industry in general, in East Africa. However, as the grantee map (see grantee map infographic) illustrates, grantees are targeting less-developed markets in West Africa, South and South East Asia, and as far as Vanuatu in the Pacific Islands. Other organisations working outside East Africa, such as Azuri Technologies, BBOXX and Off-Grid Electric, are present in several markets, and smaller players focused on a single nascent market include Oolu Solar in Senegal and Simpa Networks in India. One of the most dynamic PAYG markets outside East Africa is Ghana, where Persistent Energy Ghana (PEG) has licensed microgrid and SHS technology from Devergy and Off-Grid Electric in the past, and currently licenses SHS from M-KOPA. PEG, the largest PAYG solar provider in that market, is currently serving over 10,000 customers[23] and, under the current licensing arrangement, aims to serve 500,000 households by 2018.[24]

The most critical factor driving PAYG in East Africa is the ubiquity of mobile money—at 55%, East Africa has the highest level of penetration of any sub-region.[25] To replicate the success of the PAYG solar model in Ghana, where mobile money is less mature, PEG had to focus on customer registration, training, and agent networks.

In markets where mobile money is undeveloped, alternatives to mobile payments are used, such as premium SMS and airtime.[26] Lumos, a Phase 1 grantee, is successfully using airtime as a payment mechanism for its PAYG energy service. This has helped to establish PAYG in Nigeria, the largest off-grid market in Africa and a fledgling mobile money market with less than 10% penetration. Lumos and MTN Nigeria have a revenue-sharing agreement whereby customers simply purchase an energy service package with airtime, as they would any other mobile value-added service.

Using airtime is not without challenges, however, and requires a close partnership between the PAYG provider and the MNO. This solution entails a "tight and deep integration between the service provider and the MNO's messaging and billing systems, and requires that the service provider comply with stringent 'telco-grade' service-level agreements on high availability of service, including geo-redundant servers, dynamic scalability, replication, and persistency."[27] It should be noted that regulations surrounding the use of airtime to purchase services other than mobile vary across different markets.

Elsewhere, over-the-counter (OTC)[28] transactions are prevalent in markets such as Pakistan, where mobile money was initially launched with an OTC-centric value proposition, or in Cambodia, where mobile handsets do not support the script for the local language. Some PAYG providers, such as Fenix International, register new customers to mobile money, then teach them how to use it and make payments independently, thereby reducing the incidence of OTC. OTC can potentially constrain service availability for customers, wider mobile money usage for MNOs, and financial inclusion in general.

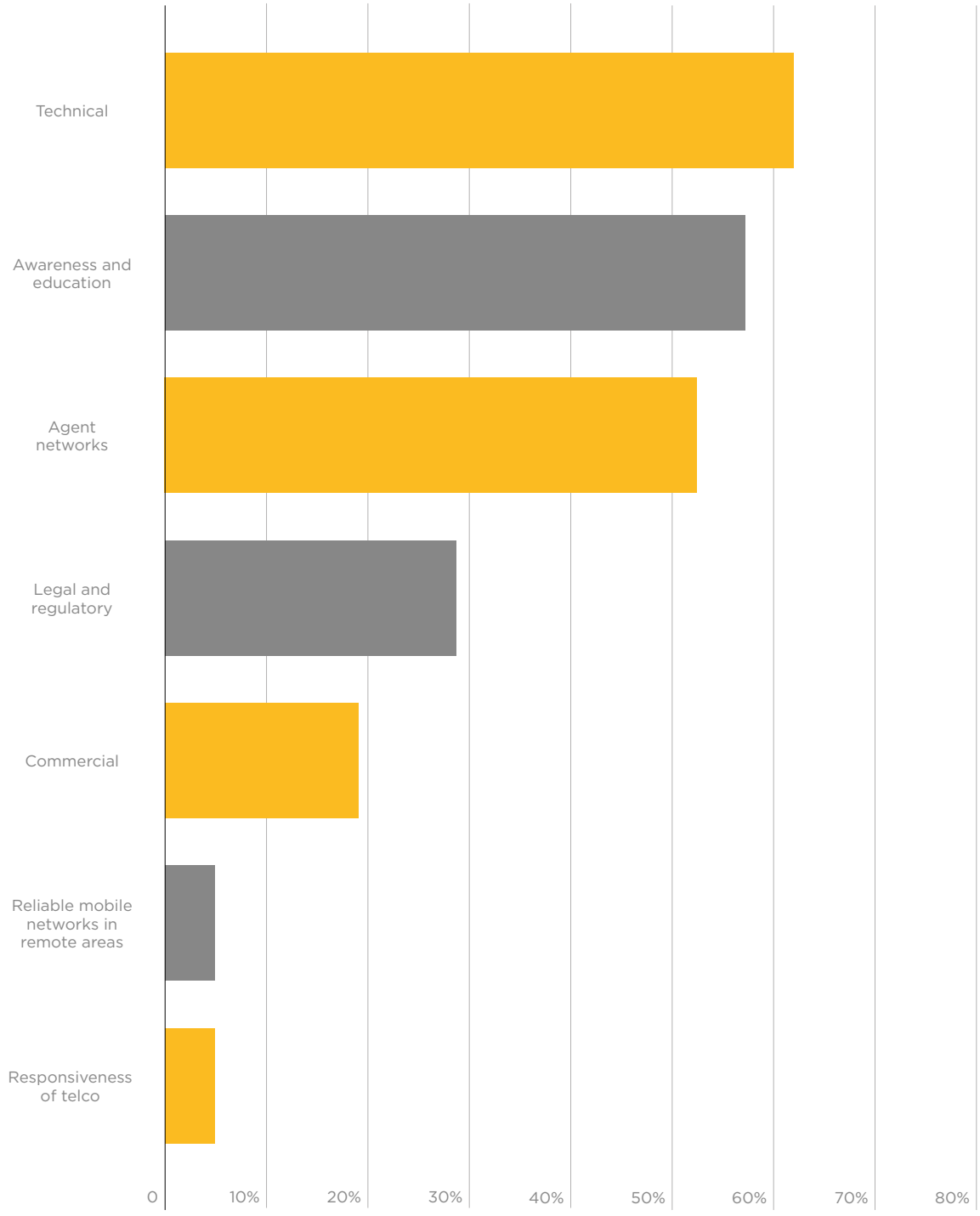
… but there is still room to grow and challenges to overcome

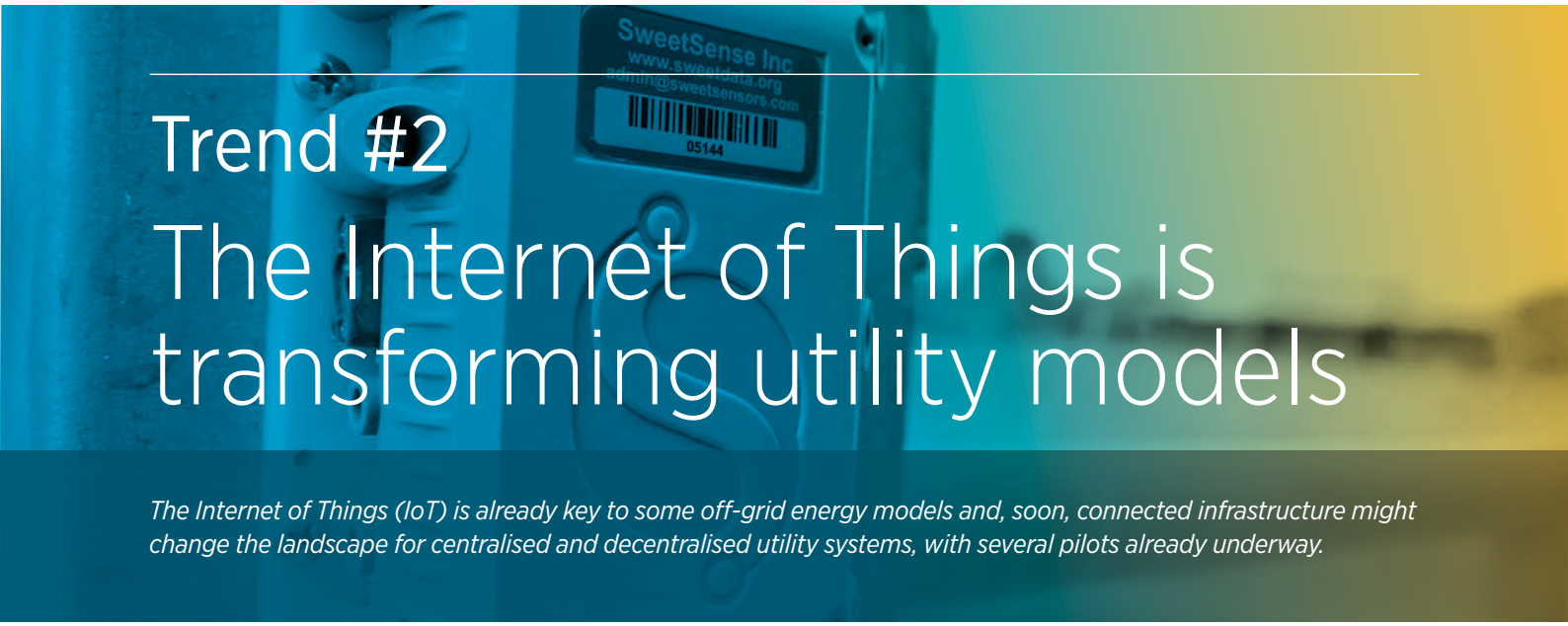
Even in markets where a robust mobile money ecosystem is in place, implementation challenges can be rife. A survey of PAYG practitioners and other stakeholders revealed that technical challenges were most common, followed closely by awareness and education and agent networks, with the vast majority of respondents indicating more than one challenge (see Figure 4). Application programming interfaces (APIs), or the lack thereof, were a common complaint when respondents were asked to provide more information on the challenges they encounter.

23. Ghana Web, June 2016, "Solar energy delivery gets a major boost," https://asokoinsight.com/news/solar-energy-delivery-gets-boost-as-energy-access-ventures-invests-in-peg-ghana
24. GSMA Mobile for Development Utilities programme, March 2016, "PEG Ghana: Licensing Solar-as-a-Service in a New Market", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/03/GSMA_Report_PEG_Ghana_Licensing_Solar_As_A_Service.pdf
25. GSMA Mobile Money programme, 2015, "2015 State of the Industry Report on Mobile Money," http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/04/SOTIR_2015.pdf
26. GSMA Mobile Enabled Community Services (MECS) programme, May 2014, "Supplement: the role of digital currencies and bill payment in mobile-enabled community services, predicting the future of mobile-enabled community services," http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2014/05/GSMA_MECS_Annual-Report-2013.pdf
27. Davidi Vortman, Lumos CEO
28. A transaction is considered OTC when it is conducted through an agent's account on behalf of the customer. See the GSMA Mobile Money programme's 2015 State of the Industry Report: http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/03/SOTIR_2015.pdf

FIGURE 4

Challenges of using mobile money





Trend #2
The Internet of Things is transforming utility models

The Internet of Things (IoT) is already key to some off-grid energy models and, soon, connected infrastructure might change the landscape for centralised and decentralised utility systems, with several pilots already underway.

The Internet of Things is becoming a reality, and has the potential to reshape how services are delivered and verified. Whereas IoT and its applications are more related to quality of life improvements in developed markets, they can also help bring critical services to emerging markets, especially underserved segments, by enabling remote monitoring and control of machines and infrastructure. As the cost of computing power has declined, the cost per unit of sensors and connectivity modules has also dropped steadily, making M2M technology highly accessible to developers and enhancing innovation. As the 17 SDGs aim to tackle some of the toughest global problems by 2030, M2M and cloud computing are likely to play a central role in achieving the SDGs.

TEXT BOX 3

Internet of Things and M2M communications

"Adding electronic sensors, connected over cellular networks to global Internet databases, can incentivize fixing what we might call the Internet of Broken Things." [29]

Whereas IoT refers to the potential interconnection of smart objects and the way users interact with their environment, M2M can be viewed as "what provides the Internet of Things with the connectivity that enables capabilities".[30] With M2M connectivity, "machines" use network resources to communicate with remote application infrastructure to monitor and control either the "machine" itself or the surrounding environment.

29. Engineering for Change, April 2016, "The Internet of Broken Things", http://www.engineeringforchange.org/the-internet-of-broken-things/

In the utility sector, M2M connectivity is increasingly used for monitoring utility infrastructure remotely and, in combination with an actuator (i.e., a switch), enables the PAYG model. While still nascent in the water and sanitation space, recent pilots and deployments have begun to demonstrate the impact of connected water infrastructure (such as handpumps) on system functionality, for which data visibility and accountability are key. Looking ahead, the convergence of new technologies, such as Low Power Wide Area (LPWA) networks,[31] blockchain, and big data are also creating exciting growth opportunities for both centralised and decentralised utilities.

What technologies will impact emerging utility models?

The functionality of the IoT and the data transmitted are determined by the nature of sensor measurement and/or actuators to perform a physical activity, as well as the underlying long-haul connectivity technology.

TABLE 3 Source – ITU and GSMA

Examples of sensors used in emerging utility infrastructure

Measurement	Functionality	Application examples in the utility space
Battery-charging level	Detect state of charge (e.g., electrical changes in composition of substances)	Monitoring battery charge levels in SHSs, enabling predictive maintenance, and detection of any hardware faults
Water flow	Induce a voltage/pulse when a rotor rotates, enabling a flow rate measurement	Quantify the volume of water flowing through a pipe or water pump, enabling an automatic maintenance scheme when a malfunction is detected
Motion/velocity	Detect system or parts movement	Monitor the movement of a system, for example, the up and down motion of a pump handle to know when it is in use
Infrared	Detect amount of heat in different mediums	Monitor the usage of facilities like latrines, to evaluate the number of users and trigger the waste collection process
Pressure/load	Detect force being exerted against a device	Monitor weight levels of faecal sludge for automated waste collection services
Location (GPS)	Provide position, velocity and timing information	Detect the location of a system (e.g., SHS, water pump, toilet) or the routes taken by vehicles (e.g., monitoring of faecal sludge truck routes)

30. Telefónica, 14 May 2013, "What's the difference between M2M and IoT?", https://iot.telefonica.com/blog/what-is-the-difference-between-m2m-and-iot
31. The GSMA Connected Living programme's Mobile IoT Initiative aims to accelerate the commercial availability of LPWA solutions in licensed spectrum: http://www.gsma.com/connectedliving/mobile-iot-initiative/

The connectivity requirements for different types of IoT networks vary widely, depending on their purpose and resource constraints. Each technology has distinct characteristics, including the range of their signal, the extent of their data throughput (or bandwidth), and the power needs of the communications device (or battery life). Table 4 summarises the current connectivity solutions for utility models in urban and rural settings.

TABLE 4 Source – ITU and GSMA

Main connectivity solutions for utility models

Setting	Decentralised systems	Decentralised clustered systems	Centralised systems
Technology	Wide Area Network (GSM, LPWA)	Wide Area Network (GSM, LPWA) and Personal Area Network (Zigbee)	Personal Area Network (Zigbee)
Details	Individual connections in low-density environments are more likely to rely on GSM as backhaul technology to send data directly over long distances to a central server	Connected systems in high-density environments use local nodes (e.g., Zigbee) to create a networked architecture while relying on a central GSM gateway to send data over long distances	Connected systems in high-density/ urban environments are most likely to rely on a combination of RF connectivity solutions and aggregators to transfer data
Applications	SHSs, handpumps, water kiosks, latrines	Smart household meter in microgrids	Grid electricity and piped water connections

Which Wide Area Network technology?

For emerging utility models, mostly operating in rural locations, GSM remains the most widely used M2M technology for transferring data over long distances (Wide Area Network) due to its de facto standardisation and interoperability, ubiquitous coverage (about 90% of the world's population), wide availability of chipset, and relatively low price (USD 6–8 per module). However, it has several drawbacks for IoT applications:

- High total cost of ownership – when sensor networks send SMS at regular intervals, costs can accumulate very quickly
- High power consumption – cellular communications are power hungry, up to 10 times more than LPWA solutions
- Unreliable mobile coverage – GSM connectivity can be patchy in remote areas, and developers have to build a robust code for connected units to deal with intermittent coverage.

Given most utility applications only require occasional connectivity with minimal throughput, novel technologies are most likely to disrupt current applications relying on GSM connectivity in the next five to ten years. There are two main Wide Area Network connectivity solutions which would further support IoT growth: cellular IoT technologies in licensed spectrum (three technologies—EC-GSM-IoT, LTE MTC CatM1, and NB-IoT— are now standardised in 3GPP) and LPWA that uses proprietary radio technologies in unlicensed spectrum.

Using a standardised approach, mobile operators are promoting the ability of cellular technologies to make data accessible on multiple platforms. These cellular LPWA technologies, designed specifically for the Mobile Internet of Things (Mobile IoT) can support a range of mobile network bandwidth and performance requirements, suitable for many smart cities and smart utilities applications. In June 2016, standards body 3GPP published the Release-13 specifications for the three licenced spectrum Mobile IoT technologies, which will be ready for commercial deployments in 2016–2017. These technologies will be deployed for IoT applications in the

low-end sensor segment, with very low data throughput, price and power consumption, similar to proprietary solutions in unlicensed spectrum already available for deployment. However, the proprietary aspects of such technologies also make them less interoperable on a large scale, raising questions about the quality of service, security and reliability.

Cloud computing and the value of big data for utility infrastructure

In addition to the possibility of controlling devices remotely, integrated M2M components in utility infrastructure allows service providers to collect a wealth of data on their system operations. Cloud computing now makes it possible to analyse large quantities of data to generate specific insights and intelligence, converting guesswork and speculation into predictive and analytical power.[32] Using machine-learning algorithms on integrated data seems to be key to extracting accurate insights and triggering the right actions.

Big data adds value for utility models, allowing them to:

- Generate insights on real-time operations – the ability to transmit data over long distances, in real time, enables service providers to closely monitor operations and system activities. With alerts for malfunctions or thefts, corrective actions can be taken instantly either by contacting end users or sending agents on site. Such remote diagnostics often allow service providers to troubleshoot problems at a very early stage of development.

- Define a "normal behaviour" profile – the fast and regular flow of infrastructure data also defines typical usage patterns. With connected handpumps, the system can learn more about normal operation and report when there is significant variation in usage. For its smart handpump research project in western Kenya, Oxford University combined a hardware solution (sensors installed in the pump handle) with a machine-learning system[33] to estimate groundwater at the pump, predict pump failure, and identify the user of the pump.

Benefits for MNOs

Increased usage of GSM connectivity in utility infrastructure opens up a new revenue opportunity for MNOs. For example, in the Phase 1 pilot, MTN Rwanda provided solar PAYG company, Mobisol, with an initial amount of free data for their M2M SIMs, but Mobisol paid MTN for the cost of the SIM cards and additional data.[34] Although average revenue per device may be low, such partnerships are long term and a gateway to providing more services to the utility service provider or the end user directly.

Another promising opportunity for MNOs is offering turnkey solutions to service providers willing to leverage M2M technology in their model. In the US, AT&T and SunPower have entered into an agreement that brings IoT technology to SunPower's newest home energy solution.[35] Over the next two years, AT&T and SunPower expect to wirelessly connect at least 100,000 solar electric systems in the US, providing customers with reliable access to system performance through AT&T's IoT capabilities.

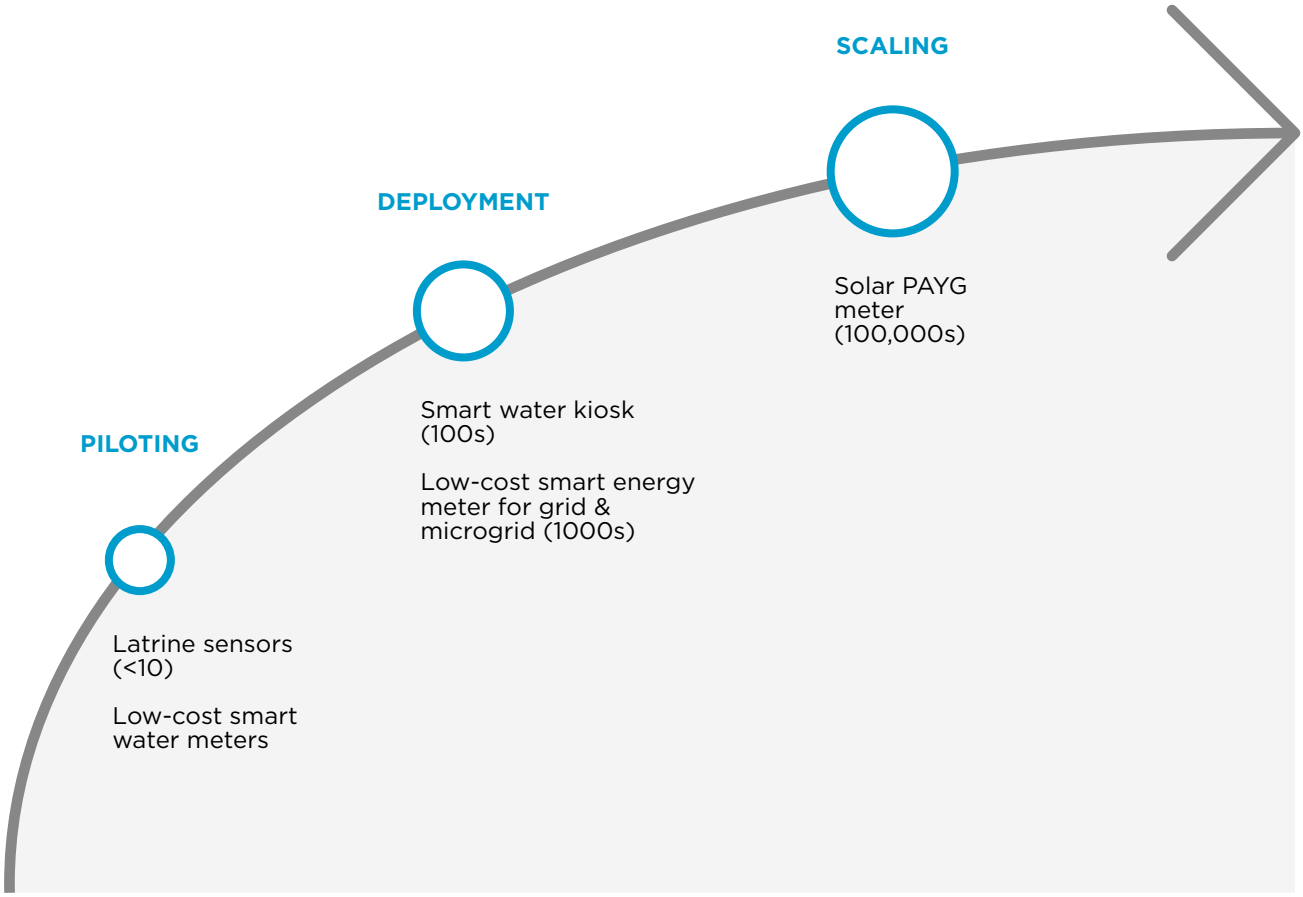
Developing M2M use cases across the utility space

Although M2M use is still limited in the water and sanitation sectors, ongoing integration in various utility infrastructures at the pilot or deployment stage is paving the way for more disruption in the utility space. The volume of M2M usage per utility application is summarized in Figure 5. However, for M2M use cases to move from proof of concept to deployment, partners such as governments and international organisations need to provide the essential capital expenditure and leverage the data that is being collected to improve service.

32. Satya Nadella, 19 January 2016, "Why we need a public cloud for the public good," Microsoft blog, http://blogs.microsoft.com/blog/2016/01/19/why-we-need-a-public-cloud-for-the-public-good/#sm.000vf30kk16keff9ueq1md8wm3wpa
33. Oxford University, Isis Innovation, "Technologies for License" http://isis-innovation.com/licence-details/smart-water-pumps/
34. GSMA Mobile for Development programme, January 2016, "Mobisol: Pay-as-you-go solar for entrepreneurs in Rwanda," http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/01/Mobisol-Pay-as-you-go-Solar-for-Entrepreneurs-in-Rwanda.pdf
35. RIoT, 28 April 2016, "AT&T nets SunPower solar business in IoT expansion push," http://rethink-iot.com/2016/04/28/att-nets-sunpower-solar-business-in-iot-expansion-push/

FIGURE 5 Source: GSMA

Volume of M2M usage in the emerging utility space



Below are some examples of Phase 2 grantees that are leveraging M2M technologies across the energy, water, and sanitation sectors.

New smart meters for urban utilities

In most emerging markets, non-technical losses, such as poor operations, low payment efficiency, or theft, are crippling energy utilities. The water sector also faces a variety of challenges, including non-revenue water, with up to 70% of water not accounted for, poor network maintenance, and a culture not driven by performance. Technology providers are new partners in the sector and have a stake in developing mobile tools that collect data efficiently for the benefit of utilities, government, and underserved consumers.

Three Phase 2 grantees are seeking to improve utilities operations in Asia and Africa:

- Dialog Axiata, in partnership with the Lanka Electricity Company (LECO), is in the process of developing and installing 3,200 GSM-enabled smart meters in a designated green zone in Colombo, 400 of which will also enable prepaid plans. Dialog will also install 144 network monitoring points to ensure LECO gets near real-time information on the state of the power distribution network. Finally, Dialog is developing an IoT platform with analytics to help LECO improve monitoring of the distribution network, as well as customer service.
- Upande has partnered with BRCK and Kericho Water and Sanitation Company (KEWASCO) in Kenya to develop and implement a set of tools that includes alert modules and low-cost solar-powered data loggers[36] to test the value of a real-time monitoring system to reduce non-revenue water losses. The data loggers will measure water flow and transmit data to the cloud to give the municipality a clearer picture of where their water is being used or lost.
- CityTaps, in partnership with Niger utility SEEN, is developing a prototype of a smart prepaid water meter to give poor urban households access to piped water connections. The meter will incorporate RF M2M technologies and allow households to make micro-prepayments for the water they use.

Low-cost energy smart meters for microgrids

For countries with high poverty levels, current models of costly, centralised electrification are just not capital efficient to offer low-income consumers. Working with microgrid operators, a new generation of entrepreneurs is providing low-cost bi-directional prepaid meters that give real-time feedback on consumption, losses or theft, and load management capability.

TEXT BOX 4

Sparkmeter and Gham Power in Nepal[37]

Phase 2 grantee Gham Power has installed SparkMeter prepaid meters for all consumers. Much like prepaid telecom connections, consumers need to select a plan and top up their accounts to consume energy. Since the consumer always pays in advance, the payment default problem is eliminated. The low-cost meters are able to read a customer's usage in real time and send that data to the cloud, where the electricity provider accesses the data online. SparkMeter has exponentially increased its impact by integrating an API that allows its software to accept payments through local mobile money apps.

36. Data loggers enable service providers to measure end user consumption; smart meters are often viewed as more sophisticated, allowing enabling providers to monitor usage and end users to also track their usage.
37. GSMA Mobile for Development Utilities programme, March 2016, "Making solar micro-grids in Nepal investible", http://www.gsma.com/mobilefordevelopment/programme/m4dutilities/making-solar-micro-grids-in-nepal-investible

Connecting toilets

To improve service delivery, sanitation entrepreneurs are beginning to pilot connected solutions across the sanitation value chain (waste containment, emptying, transport, treatment). In 2013, Portland State University (PSU) installed passive infrared sensors and GSM connectivity modules to rural latrines in Bangladesh to calculate the number of villagers using the facilities and the frequency of usage.[38] Their instruments found more than 50% exaggeration of latrine use compared to household surveys. This pilot enabled funders and development engineers to rethink how they implemented sanitation programs. Phase 2 grantee, Sanergy, is piloting sensors at entrepreneur-operated latrines in informal settlements in Nairobi, Kenya to assess the value of automatic reporting. The first phase of the study focuses on selecting the most appropriate sensor technology to detect fill rates and identify latrine usage trends to understand when the waste has to be collected.

The complexity of developing a robust M2M solution

Developing and manufacturing new hardware is inherently risky, and unforeseen problems can cause significant delays. For connectivity and IoT technology provider BRCK in Kenya, it was only near the end of the prototyping phase that it began seeing indicators that the variable performance of the units may not be entirely due to errors in development, but to larger infrastructure issues, such as unreliable mobile networks. To cope with network failures, BRCK had to develop a more robust General Packet Radio Service (GPRS) code.[39] In Cambodia, the limited reach of the GSM network prevented solar PAYG provider Kamworks from consistently switching off systems, which encouraged customers to delay payments in some areas.[40] Finally, in Rwanda, after PSU performed laboratory testing on all sensors before placing them in handpumps, it found the hardware needed to be improved due to certain challenges encountered in the field:[41] the sensor and antennas had to be placed outside the handpump in order to operate, and battery life in extreme conditions was lower and difficult to predict, which affected the functionality of the sensor. These discoveries led PSU to develop a new and more robust version of the sensor.

38. Emory University, Portland State University, International Centre for Diarrheal Diseases Research, Bangladesh, April 2015, "Report on a study to independently assess latrine coverage and use under BRAC's WASH II project in Bangladesh: Final report", http://nl.ircwash.org/node/79348
39. Kurt Unger, 7 May 2016, "Creating world class hardware in Kenya", BRCK Blog, http://www.brck.com/2016/05/creatingworldclass/
40. GSMA Mobile for Development Utilities programme, May 2016, "Kamworks: Introducing GSM-enabled PAYG Solar in Cambodia," http://www.gsma.com/mobilefordevelopment/programme/m4dutilities/kamworks-introducing-gsm-enabled-payg-solar-cambodia
41. GSMA Mobile for Development Utilities programme, March 2016, "Portland State University: GSM-enabled sensors for monitoring handpumps to improve water services in Rwanda", http://www.gsma.com/mobilefordevelopment/programme/m4dutilities/portland-state-university-gsm-enabled-sensors-for-monitoring-handpumps-to-improve-water-services-in-rwanda



Trend #3

Challenges remain in powering telecom towers as an anchor business for community power

Off-grid energy companies, particularly microgrid providers, may seek to anchor their businesses to powering telecom towers—a viable way to power surrounding businesses and communities. Community Power from Mobile (CPM) models are seeing traction in some markets, but aligning the incentives of all parties remains a challenge.

Leveraging mobile infrastructure to expand energy services to the underserved continues to appeal to some decentralised energy service companies (ESCOs) and international donors, but there has been relatively little market adoption. In the CPM business model, decentralised ESCOs build a viable business by powering an off-grid telecom tower with renewable energy,[42] and surrounding rural businesses and households through a microgrid and/or energy hub (e.g., distribution of charged batteries/appliances). The mobile tower is an anchor client that brings significant consumption and reliable revenue, whereas households and businesses consume and pay smaller amounts irregularly. The model has the following potential benefits for MNOs:

- **More efficient and affordable renewable energy solutions** than diesel for an estimated 390,000 telecom towers that will be off-grid, and another 790,000 that will be in bad-grid[43] locations by 2020 (an increase of 22% and 13% from 2014);[44]
- **Increased customer revenue** from access to energy for mobile phone charging, removing a common barrier to rural usage; and
- **Positive operator brand image** from sharing tower power with the community and community protection of the shared power asset, which can reduce theft and vandalism.

42. Typically a solar-diesel hybrid system for sufficient back-up generation.
43. Locations that are connected to the grid, but face more than six hours of power cuts per day, on average.
44. GSMA Green Power for Mobile programme, December 2014, "The global telecom tower ESCO market: Overview of the global market for energy to telecom towers in off-grid and bad-grid areas", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2015/01/140617-GSMA-report-draft-vF-KR-v7.pdf

Despite these anticipated benefits, there have been significant challenges to successfully deploying this model, as detailed in our last Annual Report.[45] Over two years later, we are seeing evidence of the same challenges preventing this new rural electrification model from taking a strong hold in the market. The main challenges still are:

- the time it takes to build relationships with MNOs;
- concerns of MNOs about the risks of new business models and technologies supporting their core asset (the network); and
- the expectation of MNOs that solutions be scaled rapidly.

There are other challenges as well. First, CPM requires dense populations of sufficient size surrounding off-grid towers to make grid connections to businesses and/or households financially feasible. Although some models may use hubs to distribute charged devices for households outside the range of the grid, there still needs to be sufficient demand. Asian markets, such as India and Bangladesh, tend to have more off-grid sites that meet this condition than African markets, where off-grid communities may be smaller and more disperse.

Second, telecom towers are increasingly managed and/or owned by third-party tower companies, which makes the business models and incentives for partnering with a third-party ESCO for CPM more complex:

- Unlike MNOs, tower companies are not motivated by the benefits of increased phone usage when surrounding communities gain access to power for phone charging. The limited revenue from selling power to low-income communities is also not likely to motivate tower companies to implement the CPM model themselves. However, reduced vandalism to infrastructure based on a sense of shared value could be a benefit for tower companies.
- The motivation of tower companies to partner with ESCOs seeking to implement CPM depends on their existing energy assets. If a tower company has acquired assets recently, it may be reluctant to pay for energy services from an ESCO if that includes the capital costs of new energy-efficient infrastructure. Rather, the tower company will focus on execution and capital recovery and will look for efficiency improvements only after this has been achieved. Similarly, tower companies backed by private equity may have an incentive to keep energy-generating assets on their balance sheet that increase their valuation, rather than sell them and outsource energy generation.

The variety of commercial agreements between telecom and tower companies, and the impact of various factors on CPM model incentives make it difficult to identify a single 'formula' for aligning the value propositions. Some of the challenges to implementing CPM models are exemplified by the failure of two Phase 1 grantees to successfully execute CPM pilots:

- African Solar Designs sought to test the CPM model with one of Airtel Kenya's rural towers. As highlighted in the full case study,[46] negotiations with Airtel Kenya, and later its tower company (Africa Towers), were lengthy as Airtel sought assurance that the technical design, service level agreement, and power purchase agreement would meet its requirements for continuous uptime and reduce operational expenditure, two main drivers of its business. Without assurance on these priorities, Africa Towers did not seem motivated by the secondary benefits described above. Furthermore, senior management was focused on the impending sale of their tower assets to Eaton Towers. At the same time, African Solar Designs was leveraging its Innovation Fund grant for a single tower pilot and was unable to answer Airtel's questions about the outlook for rapidly scaling to multiple towers.
- In contrast, Emergence BioEnergy (EBI)[47] was able to leverage close relationships with Grameenphone in Bangladesh to come to an agreement on powering two towers at the outset of the CPM pilot. However, EBI's use of biogas (from chicken waste) for power supply ran into significant

45. GSMA Community Power from Mobile programme, January 2013, "Service over technology: Defining the role for mobile in energy access", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2013/02/Service-over-Technology-CPM-White-Paper.pdf
46. GSMA Mobile for Development Utilities programme, April 2016, "African solar designs: Trialling the Community Power for Mobile model in Kenya", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/05/M4D-Utilities-African-Solar-Design-case-study.pdf
47. GSMA Mobile for Development Utilities programme, February 2016, "Emergence BioEnergy, Inc.: Energy from biomass for telecom towers and communities in Bangladesh", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/03/Emergence-BioEnergy-Inc-01022016.pdf

technical challenges and logistical requirements (such as a large area of land and transport of odorous waste) that were incompatible with tower sites. While EBI had an agreement with an MNO at the outset, the challenges they faced in testing a new power solution underscore the importance of presenting operators/tower companies with proven technologies, given their non-negotiable requirement for uninterrupted service.

To date, the CPM model has seen isolated success and scaling, but a few examples suggest some factors for success such as:

- Strong knowledge of and connections with telecom and tower management industries;
- Extremely strong market demand from one or more stakeholders;
- Alignment of value propositions to benefit mobile operators;
- ESCO proof of operating abilities; and
- Sufficient and flexible time and money to support lengthy negotiations with all stakeholders.

These factors are necessary in most cases and apparent in the examples below, but they may not always be sufficient. The cases above had some of the success factors in place, but they failed for other reasons. Again, this highlights the challenge of developing a single formula for making the model work.

OMC Power[48] in India has successfully scaled its CPM business by offering a value proposition that meets a strong market demand. Over 230,000 towers in India are either off-grid or are served by an unreliable grid,[49] and many are surrounded by dense populations. Tower companies that have been operating in India for many years often have energy systems that are expensive to operate, and are seeking efficient, renewable energy solutions to cut costs and comply with government requirements. OMC's "Micropower Plants," consisting of large solar arrays and battery banks, offer a superior power solution for towers and power small businesses and households via smart microgrids. They enable consumers to subscribe to prepaid "energy packages" with power budgets based on their needs, with flexible time of day selections to suit their lifestyle and working hours. This allows OMC to cater to all types of customers, from individual households with 1–2 lightbulbs to larger enterprises and institutions, such as hospitals or petrol pumps. Furthermore, all three co-founders of OMC have held senior roles in the telecom industry, which has helped to build trust and address the concerns of tower companies and MNOs about network reliability and operating costs. In April 2016, OMC secured USD 4.5 million in investment (debt) from the Rockefeller Foundation to grow their successful model.

Gham Power, a Phase 2 grantee, has also seen promising results with its Nepal pilot, which provided the MNO, Ncell, with a solution that met a specific market demand. Gham Power has built solar microgrids in remote and mountainous regions that have enabled Ncell to build new towers where there is no grid and the costs of diesel transport can be prohibitive. However, Gham still faces several challenges to reaching scale: Nepal's off-grid regions are very difficult to reach, there are few densely populated communities around off-grid towers, and bad-grid towers are only affected seasonally, complicating the business model for an ESCO. To scale their model with Ncell and perhaps other operators, Gham will have to find sufficient sites where there is a strong market opportunity to support expansion of the mobile network into remote, off-grid areas.

Conclusions

Evidence of viable CPM business models in Asia and Africa is still limited. More tower companies in the market, specific geographical requirements, and a multitude of dynamic market factors, have meant the value proposition is not yet strong enough for stakeholders in certain contexts. With declining customer ARPUs and the costs of technology upgrades, MNOs and tower companies have, for the most part, maintained a strict focus on core business drivers to operate their network rather than secondary benefits for MNOs. Given this, it is likely that stand-alone microgrids (i.e., not powering towers) and SHS businesses, which leverage mobile in other ways, will grow more rapidly in the mobile-enabled energy space.

48. http://www.omcpower.com/
49. GSMA Green Power for Mobile, December 2014. See above.



Trend #4
Steady expansion in distribution and branding partnerships with MNOs

Leveraging the distribution networks of MNOs remains somewhat challenging, but can yield significant value for both utility service providers and MNOs, particularly through co-branding.

The far-reaching distribution and sales networks of MNOs, combined with their recognisable and trusted brands, give utility service providers the opportunity to leverage these assets to reach underserved customers. However, these partnerships require a deep level of engagement (see Section 3), making uptake slow or even non-existent in the nascent mobile-enabled water and sanitation sectors, where these partnerships may be less relevant. Even in the mobile-enabled energy sector, difficult and complex logistics involved with selling hardware such as SHSs, together with MNOs' agent networks not being well adapted to sell such products, has resulted in few utility service providers leveraging such assets.

Nevertheless, there are a handful of success stories of service providers leveraging MNO networks to sell their products, and some grantees of the M4D Utilities Innovation Fund, such as Lumos,[50] have proved there can be major benefits to these distribution models.[51]

Branding is also a valuable asset, and there are some unique examples of service providers and MNOs co-branding for mutual benefit. Fenix[52] in Uganda and Lumos in Nigeria have partnered with MTN in their respective markets, as have M-KOPA with Safaricom in Kenya, and Cellcard with Kamworks in Cambodia (see examples in Figure 7). All are supported by the M4D Utilities Innovation Fund.

A recent study found that nine out of 30 energy companies interviewed are cooperating with MNOs for distribution.[53] The nature of the distribution, sales, and branding model with the MNO can take many forms (see Table 5) and is dependent on a multitude of factors, including market context, type of product/service, and the depth of partnership.

50. Lumos: http://www.lumos-global.com/
51. Organisations have also partnered with entities other than MNOs for distribution and sales. For example, specialist distributors such as Frontier Markets in India and Greenlight Planet, through their Global Partnerships.
52. GSMA Mobile for Development Utilities programme, 14 December 2015, "Fenix International: Scaling pay-as-you-go solar in Uganda", http://www.gsma.com/mobilefordevelopment/programme/m4dutilities/fenix-international-scaling-pay-go-solar-uganda
53. Lighting Global, 2016, "Off Grid Solar Market Trends Report 2016", https://www.lightingglobal.org/launch-of-off-grid-solar-market-trends-report-2016/

TABLE 5

MNO distribution and branding assets

MNO asset		Description	Service provider and MNO partnerships
Sales network		MNOs allow partner organisations to use their agent or distribution network to sell products and services (e.g., sales of hardware or scratch cards/codes).	• Lumos and MTN Nigeria • SNV Benin and MTN Benin[54] • Greenlight Planet and Orange • Fenix and MTN Uganda • d.light and Digicel Haiti • M-KOPA and Safaricom
Logistics support		Getting products to point of sale	• Brighterlite and Telenor Myanmar • Lumos and MTN Nigeria
Warehousing		Storage of products	• Lumos and MTN Nigeria
After-sales support		MNO makes call staff available for customer service. Products, as well as accompanying battery systems, often require after-sales technical support and maintenance	• Lumos and MTN Nigeria
Marketing	**Marketing support**	ATL: TV/radio advertisements, billboards, and print BTL: Sales events at market hubs, posters, branding at points of sale	• Fenix and MTN Uganda • Devergy and Tigo Tanzania (planned) • Lumos and MTN Nigeria
	Co-branding	MNOs lend their logo and branding to the new product or service	• M-KOPA and Safaricom • SNV Benin and MTN Benin • Fenix and MTN Uganda • Kamworks and Cellcard • Lumos and MTN Nigeria

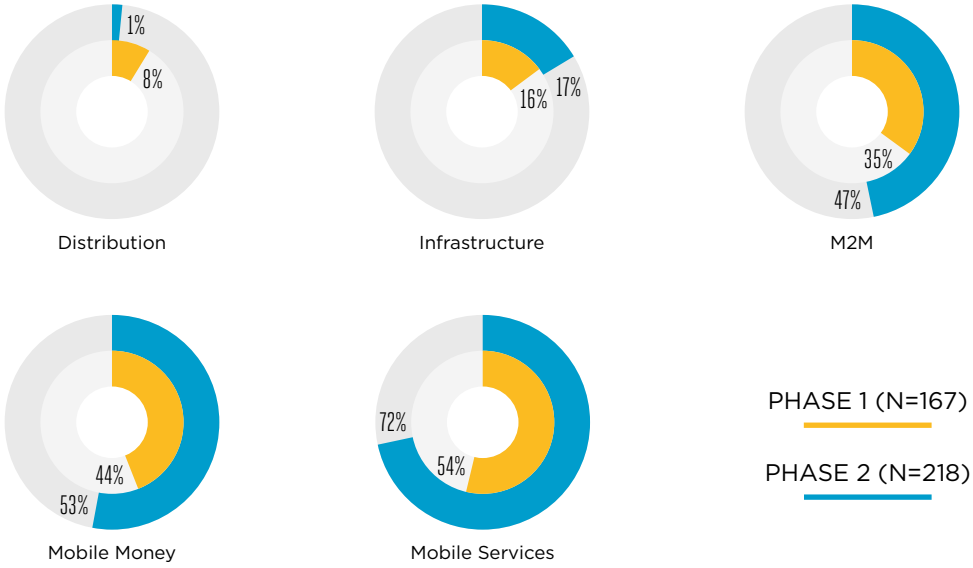
Challenges in leveraging MNO sales and distribution networks

Analysis of our Innovation Fund Concept Notes indicates a handful of utility service providers are leveraging MNO distribution channels and branding. Of all the Concept Notes (385), only 3.9% (15 in total) proposed using operators' distribution networks, far fewer than the other four mobile channels (see Figure 6). All proposals including the use of an MNO's distribution network were in the energy sector, with one exception that crossed both the water and energy sectors.

54. Mobile for Development Utilities programme, December 2015, "Catalogue of Grantees", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2015/12/GSMA_Mobile_for_Development_Utilities_Programme_Catalogue_of_Grantees.pdf

FIGURE 6 Source: GSMA

Mobile channels proposed in Innovation Fund Concept Notes



The primary reason for the lack of uptake of this valuable channel is that delivering utility products and services falls outside an MNO's core business model. In the early days of rolling out mobile money, MNOs found that leveraging existing airtime distribution network infrastructure was a formidable challenge.[55] Mobile money is a service and therefore must be offered differently from the way airtime is sold, requiring more training and oversight of agents. Similarly, energy products, particularly PAYG-enabled units, require specialised training for agents to sell them, as well as after-sales support. Furthermore, time and money must be allocated to sophisticated logistics, especially for the warehousing and transportation of bulky hardware like SHSs, and frequent technical assistance. As a result, most utility service providers have built up their own distribution channels.

Successes and opportunities

Distribution and sales

For entrepreneurs, developing a robust distribution model in countries with poor infrastructure, especially in more rural areas, multiple languages, and often difficult political situations, is a huge challenge. For young companies, leveraging an MNO's existing distribution networks allows them to grow and scale much faster than they otherwise could, cutting costs and saving time and effort. A partnership between Brighterlite,[56] a PAYG solar company and a Phase 2 grantee, and Telenor Myanmar is a good example. For MNOs, the value proposition can include significant revenue generation, gaining subscribers through new offerings (such as access to PAYG solar), and reduced customer churn (see examples in Section 3 – Graphic Box).

Two PAYG energy companies in West Africa that are grantees of our programme, Lumos and SNV Benin, have demonstrated how these MNO assets can be used for sales and distribution of SHSs and pico-solar lanterns, respectively. With a grant from M4D Utilities, SNV Benin is trialling a business model for the distribution of PAYG pico-solar lanterns, selling 9,000 PAYG Sun King Pro lamps through an existing network of 100 MTN agents in Benin. MTN agents are being trained to sell the PAYG lamps to customers by explaining their functionality, how to charge them, and how they can be used. We look forward to sharing the results of this pilot in 2017.

55. GSMA Mobile Money for the Unbanked Programme (MMU), 2011, "Building, incentivising and managing a network of mobile money agents: A handbook for mobile network operators", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2011/02/Agent-Networks-full.pdf
56. BrighterLite: www.brighterlite.com

TEXT BOX 5

Case study: Lumos and MTN Nigeria – Providing a path to scale for sales and distribution

In 2014, M4D Utilities awarded a Seed grant to Lumos, along with its partner, MTN Nigeria, to trial a pre-paid electricity service paid for with airtime and delivered in partnership with MTN Nigeria.

Leveraging MTN Nigeria's distribution networks is a key pillar of the company's business model. Through this innovative model, MTN provides Lumos with access to nationwide logistics, warehousing, inventory management, retail stores and call centre services, keeping the cost of service to a minimum and overcoming one of the main challenges PAYG providers face. This gives Lumos a head start in the market with limited overhead costs and fast access to MTN's 60 million existing customers.

This partnership allows Lumos to deliver PAYG solar in markets with limited or no mobile money adoption. In Nigeria, the Lumos solution is marketed, distributed, and sold by MTN Nigeria as the MTN mobile electricity service.

Given Nigeria's vast geography, scattered urban populations, and large rural populations, the MTN Nigeria partnership is key as it allows Lumos to benefit from the omnipresence of MTN across the country and to serve people who would otherwise be challenging to reach.

Just as prepaid airtime enabled the growth of the mobile industry in emerging markets, Lumos believes that MNOs can become leading partners in providing electricity solutions for the off-grid world. In 2016, Lumos has seen month-on-month sales growth of over 100%, leading to current sales rates of thousands of systems monthly.

Davidi Vortman, Lumos CEO, sees this partnership as integral to the company's recent growth. "MTN is helping us reach millions of current and future Lumos customers. Given Lumos' exponential growth in our first market, Nigeria, we are now looking to expand to other markets. We aim to replicate this successful mobile partnership model in other countries."

Marketing and co-branding

For any company entering a new market, building a successful brand is critical. Customer awareness of off-grid solutions is still low, demanding even more investment in capital-intensive marketing efforts.[57] MNOs offer a tremendous opportunity for entrepreneurs attempting to roll out mobile-enabled utility products to new customers through their reach and brand. However, the benefit is not just one way, as demonstrated by Fenix International's experience with MTN Uganda.[58] We are also seeing a few other effective examples of co-branding, as shown in Figure 7.

57. Global LEAP, 2015, "The State of the Global Off-grid Appliance Market", http://www.cleanenergyministerial.org/Portals/2/pdfs/Global_LEAP_The_State_of_the_Global_Off-Grid_Appliance_Market.pdf
58. GSMA Mobile for Development Utilities programme, December 2015, "Fenix International: Scaling pay-as-you-go solar in Uganda", http://www.gsma.com/mobilefordevelopment/programme/m4dutilities/fenix-international-scaling-pay-go-solar-uganda

TEXT BOX 6

Case study: Fenix International – Co-branding to build customer trust

Fenix International, in partnership with MTN Uganda, was awarded an M4D Utilities Market Validation grant to scale up ReadyPay Solar, its mobile payment-enabled energy business in Uganda. The most valuable asset that MTN shares exclusively with Fenix is its brand. The ReadyPay Solar system is co-branded with both MTN's and Fenix's logo, and the plastic casing is matched exactly to MTN's brand colour. Before Fenix launched ReadyPay Solar in Uganda, solar was often viewed suspiciously due to sub-par quality products and unethical practices by other vendors. Co-branding and marketing with MTN proved critical in establishing customer trust in these market conditions.

"People perceive MTN as a strong, authentic brand. They associate MTN with quality. In a market that has been abused by cheap, low quality products, the MTN brand provides Fenix with more acceptance than if we were selling on our own. Whenever we show up in a MTN van, a crowd assembles and we have an audience to talk about Fenix.

MTN also benefits from its association with Fenix. We have had many people say that MTN cares for them because it goes beyond the normal practice of pushing airtime and connections. It solves a critical need by bringing them safe and affordable energy."

Calvin Kaumi, National Sales Manager for Fenix

FIGURE 7

Examples of PAYG service providers co-branding with MNOs



Service providers developing their own sales and distribution channels

Despite these successful partnerships with MNOs, utility service providers are increasingly setting up their own channels for distribution and marketing to reach the last mile. These include, but are not limited to:

- training and deploying their own staff and agents (e.g., Mobisol and M-KOPA) and;
- franchising (Sanergy and BBOXX).[59]

For utility services, particularly PAYG solar, ongoing customer relationships are crucial, especially in increasingly competitive markets. Many utility service providers are therefore opting to manage the entire value chain, including distribution, directly. For example, in Rwanda, Mobisol found there was a limited pool of trained personnel, so it developed its own 'Akademie' for sales agents and technicians to ensure a standardised and high-quality level of customer service.[60] In Mobisol's experience, making utility service agents mobile money agents, rather than the other way around, has proved more effective, and actually helped to expand the MNO's footprint. Similarly, Manobi, a Phase 2 grantee, will use their existing portfolio of mWaterTM platform users, rural Water Pipe System agents, to be mobile money agents and airtime distributors for MNOs in Benin.

Franchising models have also shown promise, not only in the mobile-enabled energy sector, but for sanitation as well. Sanergy is franchising Fresh Life Toilets to create a dense network of low-cost sanitation centres in informal settlements in Nairobi, Kenya, providing—thanks to their franchise partners—707 toilets with approximately 29,800 daily uses.[61] The centres are being franchised to local entrepreneurs or Fresh Life Operators who earn income through pay-per-use fees, earning an average income of USD 1,000 per year. BBOXX's franchise model is demonstrating similar success, allowing the company to rapidly expand its SHS products, now in 58 markets worldwide, attracting on average 100–150 new customers per day.[62]

M-KOPA has chosen to adopt a hybrid sales and distribution model, selling its products through both Safaricom's retail shops and its own distribution and sales networks. CEO Jesse Moore explains why:

"When we were starting out and smaller, the Safaricom shops represented a more significant portion of our sales. We've since found it easier to scale our own channel because—while our model leverages mobile connectivity and payments—solar energy products are a different category than traditional mobile products, and so need a different sales approach to scale. However, we continue to explore ways to work more closely with Safaricom on distribution and are optimistic that we will do more sales together in future."

59. BBOXX: http://www.bboxx.co.uk/
60. GSMA Mobile for Development Utilities Programme, January 2016, "Mobisol: Pay-as-you-go solar for entrepreneurs in Rwanda," http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/01/Mobisol-Pay-as-you-go-Solar-for-Entrepreneurs-in-Rwanda.pdf
61. As stated by Sanergy, June 2016
62. BBOXX, May 2016, "BBOXX celebrates selling 70,000 systems and installing over 2MW of solar panels since 2010", http://www.bboxx.co.uk/bboxx-celebrates-selling-70000-systems-and-installing-over-2mw-of-solar-panels-since-2010/

Looking ahead

Although leveraging the footprints of MNOs may appear an obvious solution for service providers, in reality, such partnerships require significant resources and effort and depend on having certain conditions in place:

- A strong partnership with an MNO, which can take time to develop;
- A conducive market. MNOs often require exclusivity, which means co-branding partnerships in particular are most effective in markets where one MNO is dominant;
- The MNO must have a solid footprint in the service provider's target market regions;
- Well-informed and trained agents who have sufficient understanding and incentives to sell the product/service to customers;
- Independent sales models and techniques tailored for different products;[63] and
- Clearly defined after-sales support responsibilities.

While it is challenging for utility service providers to leverage the distribution, sales and branding networks of MNOs, when everything aligns, the outcome can be extremely powerful for all parties, as demonstrated in the above examples. Despite this clear opportunity, however, the majority of utility service providers are developing their own distribution channels. This is creating an interesting situation in which, in some cases, service providers are actually expanding the footprints of MNOs in areas where they may not have a presence.

We look forward to seeing how MNO and utility service provider distribution models continue to develop and whether, as mobile-enabled water and sanitation services mature, we will witness a corresponding uptake in co-branding and distribution partnerships with MNOs.

63. Based on EcoEnergyFinance's experience selling lanterns and high-capacity SHSs in Pakistan, each product requires independent sales models and techniques.



Trend #5

Mobile-enabled water services are advancing while sanitation models are still nascent

Water and sanitation businesses have grown more slowly than those in the energy sector, but there are signs that information about service delivery and new payment mechanisms are supporting business models and government partnerships, and that mobile could play a role in improving access to sanitation.

The emergence of mobile-enabled water and sanitation business models is a response to failing or non-existent services for millions—the result of poor accountability, unreliable maintenance, and inefficient payment channels. In the last two years, mobile technology is increasingly being tested as a promising solution to these challenges. Mobile solutions can introduce innovative and sustainable water and sanitation business models, and improve traditional utility service delivery through monitoring and communication of information for maintenance, planning and accountability, improved customer relationship management, and more effective payment collection. Mobile-enabled solutions for water services are seeing continued growth and development; for sanitation, however, they are still nascent.

In a major global achievement, the Millennium Development Goal to halve the proportion of the population without safe drinking water was met in 2010, well before the target date of 2015. However, 663 million people still do not have access to an improved drinking water source, and many considered to have access may actually have services that are failing.

Meanwhile, efforts to improve basic sanitation have fallen short. Due to population growth, more people (approximately 2.4 billion) now lack access to adequate sanitation than in 2000.

The new SDGs[64] set ambitious targets for addressing these gaps, but to achieve them will require a nuanced understanding of water and sanitation service delivery challenges, and the continued development of innovative models that leverage ubiquitous mobile technology. In response to remaining access gaps, services in need of improvement, and the SDGs, the M4D Utilities programme has increased support for innovative water service models that leverage mobile technology, and added sanitation to our scope of mobile-enabled utility services.

The challenges of providing reliable and sustainable water and sanitation services

While the challenges of water and sanitation services differ across emerging markets and urban and rural settings, there are some common threads. Historically, water and sanitation services have been viewed as

64. The SDGs aim to both increase access and ensure the sustainable use and development of water resources by 2030. The target for sanitation is to achieve access to adequate and equitable sanitation and hygiene for all and end open defecation entirely.

public goods, but governments have often proven unable to provide reliable, good quality, and equitable services. The absence of policies and practices to ensure monitoring and accountability has meant services for the underserved have not improved or been adequately maintained. This has led to consumers not paying for water and sanitation services and using free, but unsafe alternatives instead (i.e., untreated or unprotected water that must be collected, or open defecation) resulting in high financial losses for utility providers.[65] In urban areas, those without piped network services typically must pay far more than others due to unregulated vendor markets. In rural contexts, efforts to create community-managed services have faced the same challenges in collecting revenue and saving to maintain services.

Traditionally, not-for-profit organisations and international donors have tried to address the access gap these challenges create. Developing and testing new business models for sustainable services take a lot of time to get buy-in to pilot and even longer to reach scale. A key difference with innovative energy service models is that consumers may be less accustomed to paying for water and sanitation services given the free alternatives, whereas even poor-quality energy resources, such as charcoal and kerosene, have a price tag. At the same time, water and sanitation models must take into account the crucial role government still plays in implementing policies and funding large-scale capital expenditure that enable equitable and affordable services, now widely accepted as a human right. Sanitation services are even more complex given the need to consider the entire value chain—from toilet to treatment or reuse.

While more mobile-enabled water and sanitation models are being piloted than ever before, these solutions are still less mature than energy models, given the newness of innovative business models, the complexity surrounding willingness to pay, and multi-stakeholder engagement.

Mobile-enabled water models are maturing and gaining traction, but sanitation models are still nascent

The use of mobile in the water sector continues to mature, as evidenced by the higher number of water sector organisations awarded grants in Phase 2. A key area of growth has been improving traditional networked utility services, which have been supported by the addition of 'Utility Partnership' grants to our Innovation Fund. Grants for mobile-enabled sanitation services were also added to the Innovation Fund, but only two were awarded.

TEXT BOX 7

M4D Innovation Fund water and sanitation grantees: Key statistics

The number of water grantees as a percentage of the Innovation Fund portfolio increased from 23% to 33% in Phase 2.

Three-quarters of Utility Partnership grants were awarded to organisations in the water sector.

Two-thirds of water and sanitation grantees were awarded Seed grants.

All nine water and sanitation grantees are based in Africa.

At the Concept Note stage, 44% of organisations in the water sector and 48% in the sanitation sector were not-for-profit businesses, compared to only 16% in the energy sector.

65. GSMA Mobile for Development Utilities programme, March 2016, "Mobile-enabled solutions for improved water service delivery in Nigeria", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/03/GSMA_Mobile_Enabled_Water_Solutions_Nigeria.pdf

Trends in water: Mobile-enabled solutions for existing water services

A key trend is water service providers (both traditional utilities and other service providers) seeking mobile-enabled tools to identify maintenance needs, improve revenue collection, and create accountability amongst all stakeholders. From basic services like SMS to more sophisticated apps and GSM-enabled sensors, water service providers are increasingly using mobile tools for more data-driven operations.

Non-revenue water, or the losses that come from leakage and billing failure, represent a significant proportion of a water service provider's expected revenue in emerging markets. For example, in Nigeria, 38% of water dispensed is non-revenue.[66] Mobile tools using voice, SMS, and data can enable efforts to reduce non-revenue water, as exemplified by Wonderkid in Kenya. Recovering more revenue enables a provider to reinvest in maintenance and expand its services to reach the underserved.

TEXT BOX 8

Wonderkid's three mobile tools to reduce non-revenue water

Wonderkid received a Utility Partnership grant to adapt and scale the following tools to four water utilities in Kenya:

- **Complaint management and tracking** system that allows customers to call or SMS complaints, report leakages, or make general queries, helping utilities ensure their response times are within those set out in their customer charters.
- **Mobile app for meter reading** that allows meters to be photographed to address disputes, meter readers to receive their assignments remotely, and office supervisors to verify meter readers' activities in real time.
- **Self-meter reading and payment** system that allows users to send in their own meter reading via SMS and receive a preliminary bill with instructions for paying via mobile money. Households that are not home at the time the meter is read are sent an SMS notification that prompts them to do this.

After several months of using Wonderkid's tools, the Kiwasco Water and Sewerage Company has already seen a reduction in non-revenue water from 50% to 43% (partly attributable to improved data accuracy), a rise in payment collection from 89% to 95%, and has been able to resolve 90% of customer complaints. With these increases in both revenue and savings, the utility expects to be able to invest in expansion strategies to reach the underserved.

Automated monitoring via sensors (using M2M communication) is another important use of mobile to manage leakages and monitor the functioning of remote infrastructure. When it comes to finding the most effective yet affordable solutions for water services, there is debate about the costs and benefits of automated monitoring technologies versus manual monitoring via SMS, apps, or calls. Sensors and automated technology used in water and sanitation are subject to harsh conditions (such as high temperatures and humidity and wet, dirty working environments) and may require stronger transmitters that can drain batteries more quickly.[67] Thus, in the short term, manual collection of data (e.g., staff or handpump attendants collecting information with a mobile app) will often be cheaper, but it requires substantial training and incentives.

66. GSMA Mobile for Development Utilities programme, June 2016, "Improving water service delivery through mobile data collection", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/06/M4D-Utilities-Improving-water-service-delivery-through-mobile-data-collection.pdf
67. GSMA Mobile for Development Utilities programme, June 2016, "Improving water service delivery through mobile data collection", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/06/M4D-Utilities-Improving-water-service-delivery-through-mobile-data-collection.pdf

TEXT BOX 9

To automate or not to automate? Two examples

Choosing manual or remote mobile technology to collect information requires assessing the water service provider's delivery challenges, specific information needs, and the context in which they are operating. The following are two Innovation Fund grantees that are piloting each option:

Portland State University[68] is a Phase 1 grantee which, together with its partner SweetSense, Inc., developed GSM-enabled sensors for Living Water International, an NGO and water service provider, to remotely monitor water handpump in two rural districts of Rwanda. The sensors automatically send data on the functionality of the handpump on a daily basis through GPRS, which can trigger a maintenance response. PSU's study demonstrated that mobile-enabled sensors significantly increased average handpump functionality and reduced the repair time compared to traditional maintenance models. The cost of the technology (for the pilot, USD 500 over an estimated two-year lifetime) is equivalent to the cost of a traditional maintenance model when the resulting pump functionality per year is considered.[69]

Safe Water Network[70] is a Phase 2 grantee that provides healthy water access to over 600,000 people in Ghana and India. Their Safe Water Stations run as small local businesses, providing dependable treated safe water to the community at an affordable price. Their grant supports the development of a mobile app for station staff to provide real-time station performance monitoring, which helps to identify needed maintenance before it becomes a costly problem. The mobile app is an important leap forward in running lean, efficient business operations using digital technology rather than pen and paper records. Safe Water Network was named a Classy Award Winner as one of the top ten innovative non-profits of 2016.

Many aspects of automated or manual solutions are important to consider, but most important is understanding that, in order to improve water service delivery systems through data, processes and people must be in place to analyse and make decisions based on the data that is collected.

An example of how water management data can be analysed and used to make critical business decisions comes from Manobi,[71] a Phase 2 grantee with a project in Benin. Manobi's mWater™ platform allows water tap attendants to digitise otherwise paper-based information on rural water pipe systems, such as the status of the pump (on/off) and litres of water dispensed. Building on the information collected through the platform, Manobi will create official profit and loss sheets for each individual rural water enterprise by combining mWaterTM and pump revenue data. The aim of the grant is for these financial documents to provide rural water enterprises with the supporting documentation they need to apply for loans from financial institutions. Therefore, the pump data will go beyond operational monitoring to create a virtuous cycle between private sector investment and improved water delivery services.

The number of pilots in mobile-enabled water services is on the rise, but making them sustainable and bringing them to scale is still a challenge. For tools that require manual data collection, finding the right incentives to encourage continuous and good quality reporting can be difficult, as highlighted in the Development Workshop Angola Case Study.[72] For manual and other mobile solutions, financial sustainability may still be a challenge, particularly if the paying "client" for the service is government, which

68. GSMA Mobile for Development Utilities programme, March 2016, "Portland State University: GSM-enabled sensors for monitoring handpumps to improve water services in Rwanda", http://www.gsma.com/mobilefordevelopment/programme/m4dutilities/portland-state-university-gsm-enabled-sensors-for-monitoring-handpumps-to-improve-water-services-in-rwanda
69. http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/06/M4D-Utilities-Improving-water-service-delivery-through-mobile-data-collection.pdf
70. GSMA Mobile for Development Utilities programme, Safe Water Network grantees: http://www.gsma.com/mobilefordevelopment/grantee/safe-water-network
71. GSMA Mobile for Development Utilities programme, Manobi grantees: http://www.gsma.com/mobilefordevelopment/grantee/manobi
72. GSMA Mobile for Development Utilities programme, June 2016, "Development Workshop Angola: Missed Calls for Monitoring Community Water Services", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/06/Development-Workshop-Angola-_-Case-Study.pdf

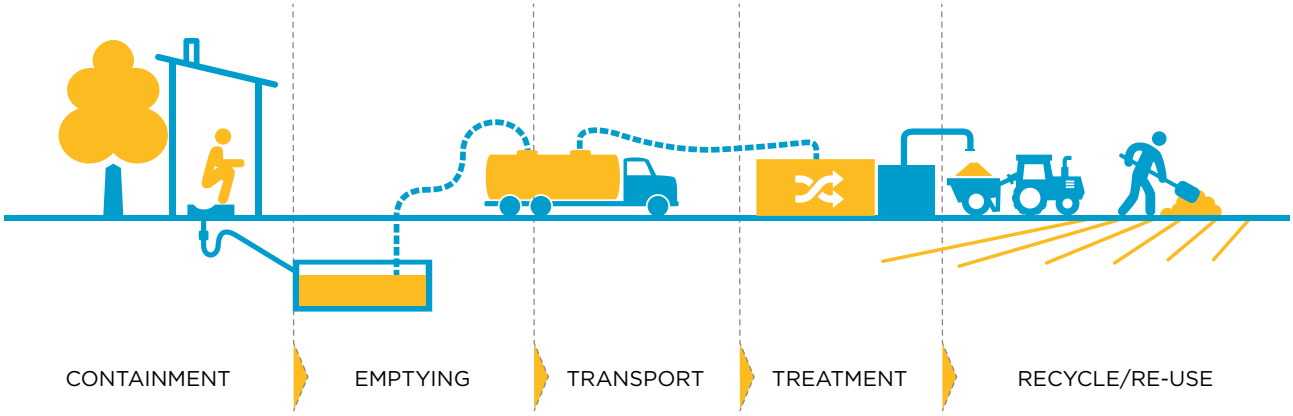
may struggle to allocate finances. More emphasis must be placed on addressing sustainability and scalability issues for mobile-enabled water services.

Trends in sanitation: Mobile tools to support the entire sanitation value chain

There is an exciting, yet nascent opportunity for mobile to help solve some of the sanitation access challenges in emerging markets. Sanitation services must address the entire value chain—from safe toilet access, to safe disposal or reuse of waste to prevent the spread of pathogens. Throughout this chain (illustrated in Figure 8), there are multiple opportunities for mobile to support data collection and communication to monitor and optimise emptying services, verify safe transport, and facilitate end-user financing and payment.[73]

FIGURE 8 Source: Bill and Melinda Gates Foundation

The sanitation value chain



Given the complexity of sanitation, commercially viable alternative models that reach the underserved are more nascent compared to the energy and even water sectors. Key challenges in implementing sustainable sanitation services include the range of organisations involved, fragmented approaches, the lack of government oversight and investment, and the lack of mechanisms for collecting waste and end-user fees. Sanitation is a particularly acute problem for the underserved in urban areas, and is further complicated by issues related to informal settlements, such as land rights and housing, transience, limited space for toilets or septic tanks, and inadequate road infrastructure for large service trucks.

In addition to the challenges outlined above, entrepreneurs seeking to improve sanitation services and install infrastructure face a lack of financing solutions. All of these issues will become increasingly important to address with the SDGs because shared toilet blocks are no longer considered "improved" sources of sanitation given the widespread failure to maintain and manage them, even with entrepreneurial management.[74]

Innovative sanitation business models are desperately needed, and mobile can offer solutions to each of these challenges through the following channels and examples:

Mobile services can improve data collection and the flow of information between stakeholders, from customers to service providers and government officials. This in turn improves accountability and

73. GSMA Mobile for Development Utilities programme, August 2015, "The role of mobile in improved sanitation access," http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2015/08/Utilities-Sanitation-Report-August-2015.pdf
74. United Nations Meta data for Goal 6: http://unstats.un.org/sdgs/files/metadata-compilation/Metadata-Goal-6.pdf

oversight, through direct SMS or calls, SMS surveys, or smartphone applications for improved customer relationship management. Many innovative sanitation businesses that are not sewer-based have a need for mobile applications that can manage supply chain logistics for efficient collection and verify safe disposal (see Loowatt example below), or for the geo-locating abilities of smartphones to optimise collection routes. There is also interest in mobile services to collect data to map service needs and promote behaviour change. For example, data could be collected via SMS survey or mobile app to geo-locate household and sanitation infrastructure, facilitate connections between various actors in a given area, and highlight the need for future infrastructure. Mobile applications might support behavioural change campaigns through the collection of data on local sanitation practices and mobile reward programmes for targeted behaviours to encourage change.

Mobile money is now available in 93 countries with 271 services,[75] and as mobile money services become even more ubiquitous, so do the tools available for sanitation service providers. Mobile money can be used to improve payment collection and financial flows throughout the sanitation value chain. Examples of this range from payment for toilet access, financing solutions for customers or entrepreneurs, mobile-based credit risk assessments, and sanitation subsidies through the government-to-person (G2P) channel. While payment collections may be the most enticing for entrepreneurs to implement, innovative payment collection mechanisms also need to be designed, as payments on a pay-per-use basis are often much smaller than standard mobile money transaction fees.

M2M connectivity is still at an early stage of implementation in the sanitation chain, as low margins combined with the high costs of M2M sensors and other technology make it a challenging integration. However, as low-cost M2M solutions emerge, possibilities include centralising real-time information coming from infrastructure that is typically challenging to monitor, or optimising sludge truck routes.

TEXT BOX 10

Innovation Fund sanitation grantees

Based in Madagascar, Loowatt Ltd.[76] will develop and test an ICT platform and mobile application to improve logistics coordination for waste collection and customer service for its waterless toilets for households in an urban area of Antananarivo. The grant aims to prove the value of ICT and mobile services by reducing the cost of waste logistics, providing assurance that waste is transported to the correct treatment locations, and collecting mobile payments from customers.

Nairobi-based Sanergy,[77] in partnership with SweetSense, will develop and test the use of sensors to determine the fill levels of Fresh Life Toilets, operator-owned waterless toilets designed for urban informal settlements. The grant will aim to test whether sensor technology works in the sanitation environment and can optimise waste collection routes and reduce operating costs.

75. GSMA Mobile Money programme, 2016, "2015 State of the Industry Report", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/04/SOTIR_2015.pdf
76. GSMA Mobile for Development Utilities programme, Loowatt grantees: http://www.gsma.com/mobilefordevelopment/grantee/loowatt-ltd
77. GSMA Mobile for Development Utilities programme, Sanergy grantees: http://www.gsma.com/mobilefordevelopment/grantee/sanergy-inc

Recommendations for water and sanitation sectors

Historically, water and sanitation have been considered a public good but, as the new SDGs highlight, more innovative and financially sustainable solutions are needed to address the huge gap between those who have access to clean water and sanitation, and those who do not. Recommendations for both sectors include:

- Additional trialling of mobile-enabled water and sanitation services – more funding should support pilots to identify best practices and key lessons.
- Sharing evidence to help unite all stakeholders – more knowledge sharing is needed between technology partners, water service providers, MNOs, entrepreneurs, and government actors to ensure a deeper understanding of the priorities, challenges, and evolving solutions in the sector.
- Align with government – mobile solutions should align with the priorities and budgets of the government, historically a challenging partner, to ensure accountability, commitment, and sustainability.
- Think outside the box for financial sustainability – the water and sanitation sectors face challenges with cost recovery, making it difficult to identify a sustainable business model. More should be done to understand the impact of mobile financial services, the cost efficiency of M2M and mobile-enabled monitoring versus human reporting, and full stakeholder engagement to ensure the inclusion of mobile translates into a service benefit or cost savings.

3 MNOs: Key actors and enablers

Over the past two years, we have seen a variety of new partnerships form between MNOs and utility service providers (both centralised and decentralised). In reviewing applications to our Innovation Fund, we have been encouraged by the number of MNOs that are finding new opportunities to partner in the sector, such as offering assets like their brand or mobile payment platforms to develop new revenue streams and improve the uptake of mobile services.

Some MNOs position themselves as innovators and champions for the industry. For example, Telenor Pakistan, a Phase 1 grantee, piloted the sale of PAYG energy products through its network of retailers and collected payments through Easypaisa, its mobile money service. Dialog Axiata in Sri Lanka, a Phase 2 grantee, is leading a project to develop and install smart solutions to improve energy access in Colombo, in partnership with LECO, an electricity utility. LECO recently won the best paper award at the Asia Utility Week Conference 2016 for this project.

TEXT BOX 11

Dialog Axiata and LECO – Working together to introduce smart metering to Sri Lanka

Dr. P.S.N. De Silva, Head of Engineering at LECO, says, "Our project is unusual in that an MNO and a utility have moved out of their silos and are jointly developing a platform to innovate new solutions. In fact, when LECO and Dialog submitted the proposal to the GSMA, the GSMA's analysis of its potential was the pivotal decision that made this concept come to fruition."

MNOs can also make direct and indirect investments in the utility ecosystem, for example, through in-house incubators. The Orange Fab incubator based in Silicon Valley has invested USD 25,000 in an SHS provider and Phase 1 grantee, and has incubated Angaza Design, a PAYG platform provider. However, such investments are still rare.[78]

We would like to see more MNOs in emerging markets engage in the utilities sector. We will continue to work directly with MNOs to identify opportunities in their market and contribute more evidence for the business case to enter into partnerships. This section goes into the details of our work to date and our objectives moving forward.

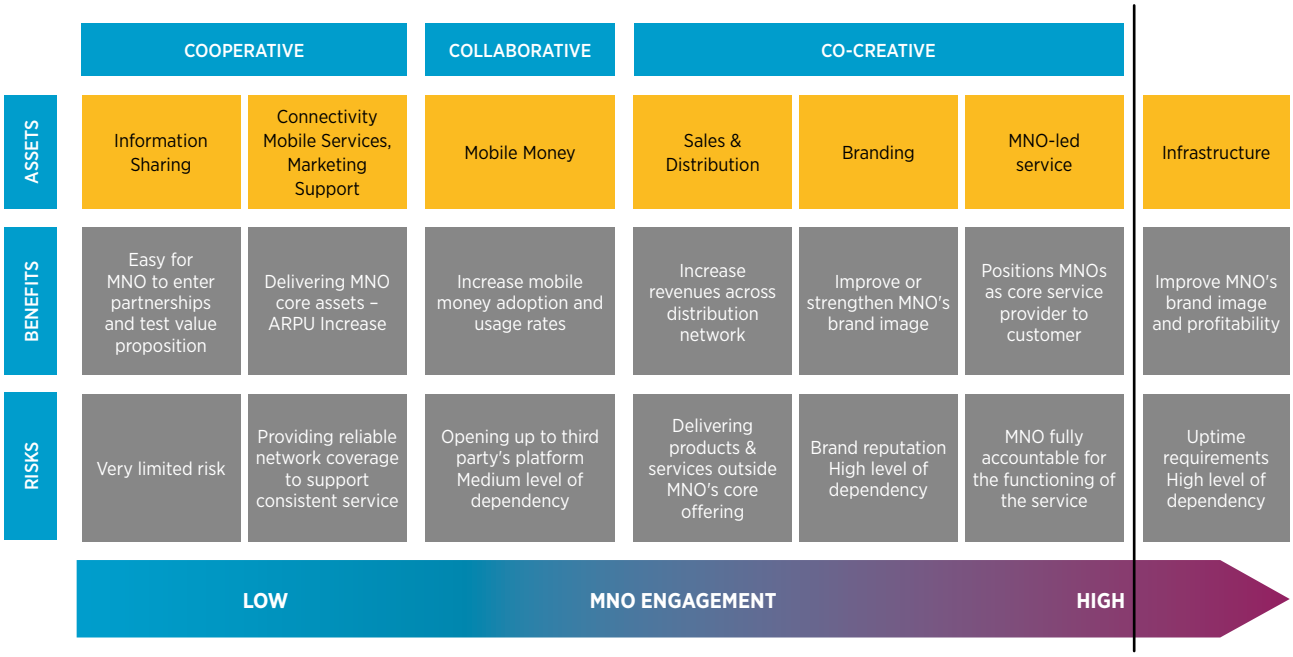
78. The GSMA Ecosystem Accelerator programme will be publishing a paper in collaboration with Delta Partners outlining the opportunity for corporate venture capital for MNOs to invest in start-ups in emerging markets.

MNOs and partnerships: Examples from the Innovation Fund

The spectrum of engagement, illustrated in Figure 9, was developed based on an analysis of 42 Innovation Fund applications[79] received in the first and second phases of funding (2013 and 2015, respectively)[80,81] that listed MNOs as partners or lead applicants. The spectrum maps these assets against different partnership models, from cooperative to collaborative and co-creative, which reflect increasing levels of engagement.

FIGURE 9

Spectrum of engagement[82]



From Phase 1 to Phase 2, there have been two changes to the spectrum:

1. As implied in Section 2, the "Sales and Distribution" asset has been moved to the co-creative model to reflect the high level of engagement necessary to implement such partnerships.
2. The "Infrastructure" asset was moved to the high-engagement end of the spectrum to reflect the high level of effort required to successfully deploy the CPM model. However, it is not included under the co-creative model as the brand of the operator may not necessarily be used in such partnership. If the brand is used, then such partnerships are considered co-creative.

79. Of a combined 93 applications. Submissions to the Innovation Fund follow a two-stage process. Short three-page Concept Notes are submitted in the first stage, then selected applicants are invited to submit a full application. See Appendix A for details.
80. GSMA Mobile Enabled Community Services (MECS) programme, May 2014, "Predicting the future of mobile-enabled community services", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2014/05/GSMA_MECS_Annual-Report-2013.pdf
81. GSMA Mobile for Development Utilities programme, January 2016, "Emerging trends in mobile enabled utility services", http://www.gsma.com/mobilefordevelopment/programme/m4dutilities/emerging-trends-in-mobile-enabled-utility-services
82. For an in-depth examination of the spectrum of engagement, please refer to GSMA Mobile Enabled Community Services (MECS) programme, May 2014, "Predicting the future of mobile-enabled community services", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2014/05/GSMA_MECS_Annual-Report-2013.pdf

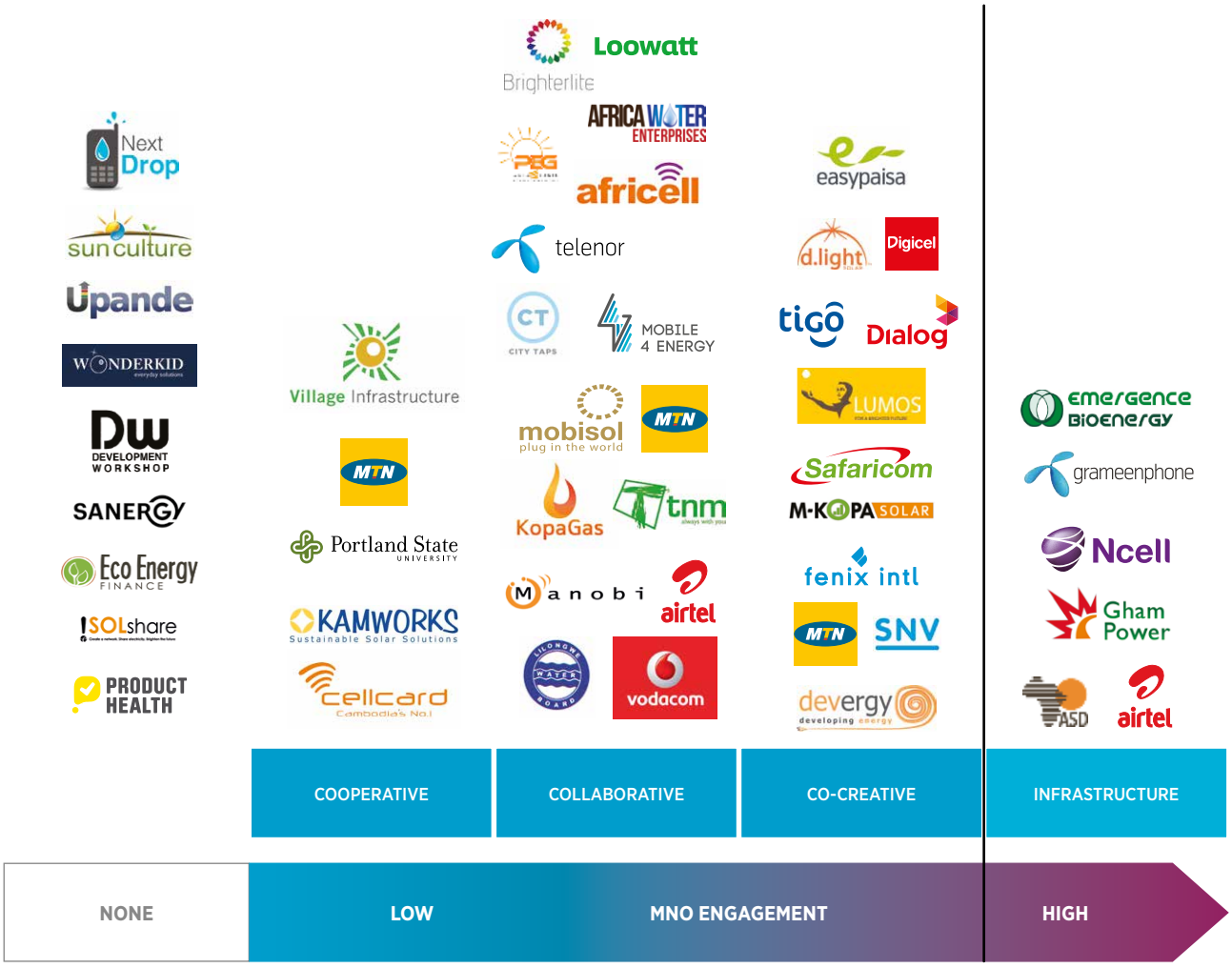
The type of partnership an MNO enters into is dictated by its strategic objectives, as well as its human resource and technical capabilities. For example, an MNO seeking to improve or strengthen its brand should engage in a co-creative partnership. On the other hand, if it simply wants to increase mobile money penetration and usage, this would not necessarily require such a high level of engagement.

From a service provider's perspective, the level of partnership, if any, sought from an MNO should correspond with the type of mobile channel being leveraged. For example, DWA and NextDrop did not need to enter into formal partnerships with MNOs when using basic mobile services to collect data.[83]

Figure 10 maps our grantees on the spectrum of engagement. While not all grantees entered into formal partnerships with MNOs, they leveraged different mobile channels to help support their businesses. At the other end of the spectrum, most of the grantees are engaged in co-creative partnerships, which require a higher level of engagement from both the MNO and the service provider. Across the spectrum, partnerships with MNOs provide benefits to both parties.

FIGURE 10

Innovation Fund grantees across the spectrum of engagement



83. GSMA Mobile for Development Utilities programme, June 2016, "Improving water delivery through mobile data collection", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/06/M4D-Utilities-Improving-water-service-delivery-through-mobile-data-collection.pdf

FIGURE 11

Types of partnerships

	COOPERATIVE	COLLABORATIVE	CO-CREATIVE
Grant	PSU in partnership with MTN Rwanda[84]	Mobisol in partnership with MTN Rwanda[85]	Fenix in partnership with MTN Uganda[86]
Description	• SIM-equipped sensors in water hand pumps • MTN Rwanda provided SIM cards free of cost dedicated to M2M communication with a monthly data allowance	• SIM-equipped SHS with mobile money-based PAYG	• Keypad-equipped SHS with mobile money-based PAYG • Co-branded with Fenix and MTN logos and MTN's brand colour • Use of MTN's marketing and distribution channels
Assets	• Mobile services • M2M connectivity	• Mobile services • M2M connectivity • Mobile money	• Mobile services • Mobile money • Co-branding
Benefits[87]	Testing new business models for M2M offerings in a new sector (water)	• Increased penetration: 20% of Mobisol entrepreneurs are new to MTN Mobile Money • Increased mobile money usage: average of 1.7 monthly mobile money payments for Mobisol business kit systems[88] • Mobisol users increased airtime purchases by mobile money by 74% over time • USD 0.58 per month per Mobisol entrepreneur in transaction fee revenues to MTN. Other revenues include M2M data traffic and phones being kept charged.	• Third largest bill pay account for MTN by transaction volume • Increased penetration: 13% of Fenix's customers are new MTN Mobile Money users • Increased mobile money usage: Fenix customers make multiple payments each month • Increased revenues from mobile money transactions and phones being kept charged • Improved brand perception among 70% of those surveyed
Risks	• Providing reliable network coverage to support consistent service	• Opening up to third party's platform	• Brand reputation
	LOW	MNO ENGAGEMENT	HIGH

84. GSMA Mobile for Development Utilities programme, March 2016, "Portland State University: GSM-enabled sensors for monitoring handpumps to improve water services in Rwanda", http://www.gsma.com/mobilefordevelopment/programme/m4dutilities/portland-state-university-gsm-enabled-sensors-for-monitoring-handpumps-to-improve-water-services-in-rwanda
85. GSMA Mobile for Development Utilities programme, January 2016, "Mobisol: Pay-as-you-go solar for entrepreneurs in Rwanda", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/01/Mobisol-Pay-as-you-go-Solar-for-Entrepreneurs-in-Rwanda.pdf
86. GSMA Mobile for Development Utilities programme, 14 December 2015, "Fenix International: Scaling pay-as-you-go solar in Uganda", http://www.gsma.com/mobilefordevelopment/programme/m4dutilities/fenix-international-scaling-pay-go-solar-uganda
87. The benefits stated here are based on the number of systems funded by the grant and observed at the end of the grant period (as described in the case studies).
88. Mobisol's systems were sold to entrepreneurs who ran a charging business thanks to the lantern, laptop, and phone charging business kit sold with the systems.

Feasibility Studies: Supporting MNO engagement in the utility sector

In addition to fostering partnerships through the Innovation Fund, the M4D Utilities programme also engages directly with MNOs to help them develop their business offerings. Through in-depth desk and field research, Feasibility Studies size the market opportunities for MNOs to develop solutions for the utilities sector, depending on the particular demand and needs in a country. We also assist MNOs in identifying potential partnerships with promising service providers, outside the Innovation Fund.

Feasibility Studies meet two objectives:

- To enhance MNOs' knowledge of the business opportunity in the mobile-enabled utility sector; and
- To share results from these market assessments with the broader ecosystem.

Our work with MNOs since 2013 has revealed that:

- To ensure the recommendations of the Feasibility Study are pursued, MNOs need to assign dedicated human resources with the appropriate technical capacity and align the strategic objectives of the group with country-level business units (OpCos).
- Partners need established operations, preferably in the relevant market, to build strong partnerships with MNOs quickly.
- Mobile-enabled utility solutions involve different mobile channels (see Mobile Channels infographic), with a focus on mobile money and M2M. This adds a layer of complexity when it comes to aligning the internal capabilities of an MNO's various departments.

In 2012, when the programme was just beginning and the market was still quite nascent, we worked with Safaricom in Kenya and TNM in Malawi to identify energy-related opportunities in the utilities sector. Since then, as the business proposition has evolved, we have broadened our scope to include new sectors such as water and new technological advances such as smart meters. The map below identifies the MNOs that have championed a Feasibility Study.

FIGURE 12

Map of MNO engagements



In 2014, we began working with Orange Group and its three OpCos in Botswana,[89] Senegal[90] and Côte d'Ivoire,[91] to explore the opportunity for MNOs to partner with ESCOs in the deployment of smart solutions to improve energy access in Sub-Saharan Africa. We also produced a comprehensive report[92] on the use of mobile for smart energy solutions based on this work. Since then, Orange has been developing smart energy solutions (see Orange testimonial).

In 2015, we partnered with Ncell to identify the opportunity for the MNO to deploy a CPM model—a microgrid using Ncell's telecom tower as an anchor tenant. The scope of the study[93] was broadened as the opportunity for PAYG SHSs was equally strong in the Nepalese market. As a result of the study, Ncell partnered with Gham Power to deploy microgrids in two pilot sites and construct two new towers to act as anchor loads. Communities around the towers now benefit from 3G mobile coverage from Ncell, as well as energy from Gham Power. This pilot project is currently underway with support from our Innovation Fund.

We have completed our latest Feasibility Studies with Etisalat Group and their business units in Nigeria and Pakistan, two of their largest markets. These studies evaluate the opportunity for PAYG SHSs and mobile-enabled water solutions in both countries. As a result of the studies, we have produced a series of reports on:

- PAYG solar in Nigeria;[94]
- Mobile-enabled water solutions in Nigeria;[95]
- PAYG solar in Pakistan;[96] and
- Mobile-enabled water solutions in Pakistan.[97]

Etisalat is currently in conversations with various service providers.

89. GSMA Mobile for Development Utilities programme, November 2014, "Mobile for smart energy solutions: Botswana", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2014/11/Mobile-for-Smart-Energy-Solutions_-Botswana-Case-Study_Final.pdf
90. GSMA Mobile for Development Utilities programme, November 2014, "Mobile for smart energy solutions: Senegal", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2014/11/Mobile-for-Smart-Energy-Solutions-_-Senegal-Case-Study_FINAL.pdf
91. GSMA Mobile for Development Utilities programme, November 2014, "Mobile for smart energy solutions: Côte d'Ivoire", www.gsma.com/mobilefordevelopment/wp-content/uploads/2014/11/Mobile-for-Smart-Energy-Solutions_-Cote-dIvoire-Case-Study_FINAL.pdf
92. GSMA Mobile for Development Utilities programme, November 2014, "Mobile for smart solutions: How Mobile can improve energy access in Sub-Saharan Africa", www.gsma.com/mobilefordevelopment/wp-content/uploads/2014/11/MECs2014_PROOF008_Single.pdf
93. GSMA Mobile for Development Utilities programme, September 2015, "Assessing the opportunity to improve energy access: Ncell in Nepal", www.gsma.com/mobilefordevelopment/wp-content/uploads/2015/10/NCell-report-October-2015.pdf
94. GSMA Mobile for Development Utilities programme, January 2016, "Assessing the opportunity for pay-as-you-go solar in Nigeria", www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/02/GSMA_Etisalat_PAYG_Final-20160211.pdf
95. GSMA Mobile for Development Utilities programme, March 2016, "Mobile-enabled solutions for improved water service delivery in Nigeria", www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/03/GSMA_Mobile_Enabled_Water_Solutions_Nigeria.pdf
96. GSMA Mobile for Development Utilities programme, May 2016, "Feasibility Study: Assessing the opportunity for pay-as-you-go solar in Pakistan", http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/06/M4D-Utilities-Feasibility-Study-%E2%80%93-Assessing-the-opportunity-for-PAYG-solar-in-Pakistan.pdf
97. Expected to be published in August 2016.

TEXT BOX 12

Testimonial from Angel Barrio, VP M2M, Etisalat Group

What are the main ways the Feasibility Study helped you to identify the opportunity?

The development and commercialisation of mobile-enabled utility services is still maturing and it is very difficult to identify the best solution to deploy in each area (energy, water, sanitation). Etisalat has a very heterogeneous footprint. The Feasibility Studies are supporting us to identify the real needs and provide the right service in every country.

In general, what role do you see your organisation and mobile network operators playing in the utilities sector?

Mobile network operators have important assets that enable the deployment of services: strong local presence, extended mobile networks, M2M capabilities, and mobile payments. The operator is the right partner to provide services in the utilities space.

What challenges do you see in fulfilling that role?

There are several challenges, including the immature market, a complex ecosystem, the lack of investors, a lack of alignment with local policies, uncertain profitability, and customer acceptance.

TEXT BOX 13

Testimonial from Alain Tales, Product Manager, Orange Digital Utilities

What service are you aiming to pilot with utilities?

Orange sees an opportunity in offering a full smart metering solution to utilities, including the communication service and a prepayment platform. The strong market potential justifies the investment required for this service, which can then be deployed in several countries.

What were the main reasons you decided to develop a utilities product offering?

Orange believes that utilities will benefit from sourcing a service from a partner that can manage the cloud infrastructure, the security, the smart metering application, and the communication. The mobile network operator committing to the delivery of the full service allows utilities to focus on running their operations, while they will rely on a trusted partner to provide them with the data.

Last but not least, Orange believes that in order to put the consumer in control of their energy consumption, prepayment is key. Prepayment technologies, such as the STS[98] Standard, have played their role, but those technologies have been standardised in the early 90s, when devices did not communicate. Orange and mobile network operators at large can help utilities in deploying future-proof prepayment services: future-proof in terms of tariff flexibility and future-proof in terms of scalability.

In general, what role do you see your organisation and mobile network operators playing in the utilities sector?

Utilities need to move to a new space where data will be key. With the arrival of decentralised energy, grid networks need to adapt to not become obsolete; it will have to not only be safe, but also become smart. Mobile network operators can help utilities in that respect by managing smart devices that need to be installed and by pre-processing data.

In general, what challenges did your organisation and will mobile network operators have to overcome to fulfil that role?

One of the biggest challenges we see is helping utilities manage the complexity of smart metering technology in terms of infrastructure and security, but also, and perhaps more importantly, the organisational and process changes it requires at the utility level.

98. Standard Transfer Specification

Moving forward

While Feasibility Studies allow us to develop a high level of engagement with MNOs, there is also room for lighter-touch engagements that fulfil our programme mandate to improve the mobile industry's knowledge of opportunities in the utilities sector. As a result, we have been developing a suite of tools to complement these studies, starting with a Partnership Assessment Tool.

The Partnership Assessment Tool is mostly for MNOs in the early stages of identifying the opportunity and evaluating whether to engage in this space. It includes a questionnaire for MNOs on their internal capabilities and strategic objectives. The responses are benchmarked against best practices we have gathered and the results are shared with MNOs, along with our recommendations. In addition to the Partnership Assessment Tool, we are developing our database of evidence for the sector, collecting qualitative and quantitative data to demonstrate the benefits of partnering with utility service providers.

MNOs' knowledge and interest in the mobile-enabled utilities sector continues to grow, driven notably by partnerships with PAYG solar service providers, which offer one of the most mature business propositions, as well as the increasing prominence of IoT. There is still work to be done to better define the opportunity for MNOs and support their engagements in partnership with decentralised service providers and centralised utilities.

TEXT BOX 14

Call to action for MNOs interested in engaging with M4D Utilities

Please get in touch with us:

- If you are an MNO interested in the M4D Utilities sector;
- If you are interested in leveraging innovative solutions to provide critical utilities services to your customer base while also improving your revenues; or
- If you are willing to support a collaborative study with the GSMA.

m4dutilities@gsma.com

4 Investment in off-grid mobile-enabled utility services

Investments in enterprises delivering off-grid mobile-enabled utility services have grown exponentially since 2014.[99] About 87%[100] of all commercial investments to date in the mobile-enabled off-grid energy sector have been made in the last two and a half years. However, success in attracting private capital has been limited to PAYG solar companies that have been able to demonstrate promising business models.

Given the growing interest from investors, it is appropriate to ask whether there is still a need for grant funding. We believe there is. Grant capital is still important for:

- Developing viable business models in other sectors, such as water, sanitation, and clean energy for cooking and productive uses;
- Encouraging innovation and product development in start-ups or even established businesses, as private capital is almost always directed towards supporting growth and replication; and
- Supporting the industry in greenfield locations in South and South East Asia and Central and West Africa. Geographically, investments have been mostly limited to East Africa, with Kenya and Tanzania alone accounting for about 45% of all investments in PAYG solar.[101]

The following sections provide details on the impact of grant investments, as well as the emerging trends and gaps in the current investment landscape.

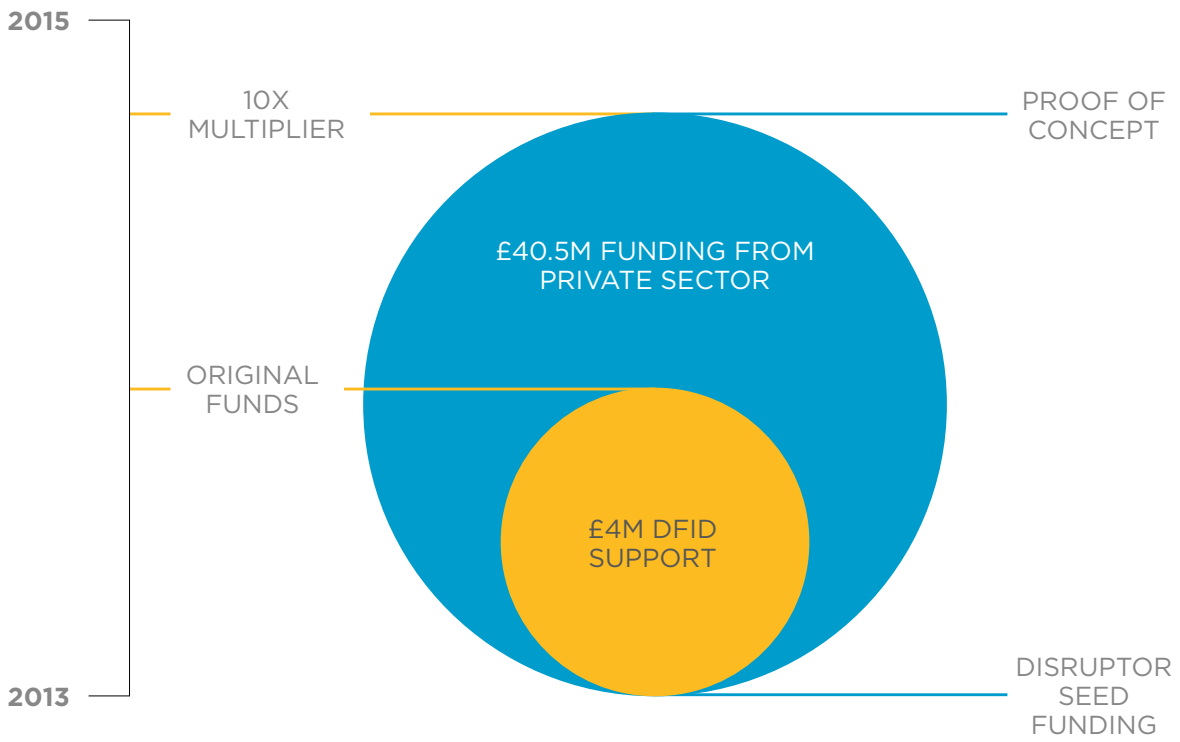
99. The data here refers to off-grid mobile enabled utilities, including energy, water and sanitation.
100. GSMA estimate
101. GSMA estimate

Unlocking investment opportunities through grant funding

Across two phases of funding, the Innovation Grant Fund has awarded GBP 5.6 million to 34 organisations across 21 countries. Of the 13 energy and water organisations funded during Phase 1, a handful have attracted additional funding from commercial investors during or immediately following our funding period. M4D Utilities estimates show that Phase 1 grantees leveraged GBP 4 million of the total programme budget to raise more than GBP 40 million between 2013 and 2015. For instance, in 2014, Mobisol, an energy company selling prepaid SHSs and one of our Phase 1 grantees, raised about GBP 20 million in grants and commercial investments from a consortium of investors to scale operations in Tanzania and Rwanda.

FIGURE 13

Investments raised by grantees in 2013-2015



The amount of funding channelled to the energy sector compared to the water and sanitation sectors remains high. This flow of investment reflects the relative maturity of the energy sector, where commercial business models are more dominant and customers are accustomed to paying for products and services. Conversely, commercial investment in organisations using mobile in the water and sanitation sectors is still nascent, in part because customers have a long history of non-payment and business models have yet to be proven. However, organisations such as Sanergy, a Kenyan organisation that aims to make hygiene-based sanitation affordable and accessible in urban slums, raised USD 1.7 million in February 2016 from a consortium of investors, indicating that water and sanitation services are beginning to garner commercial investment.

TEXT BOX 15

Stone Family Foundation: Investing in water and sanitation

The Stone Family Foundation (SFF) is a UK grant-maker that aims to increase global access to water and sanitation by looking at the role that the private sector can play in accelerating coverage to high-quality, affordable and sustainable services. It provides risk capital in the form of grants and investments to private companies, social enterprises and market-led NGOs to help them prove their business models and attract scale-up funding from private, philanthropic or public sector sources. To date, the SFF has disbursed GBP 16.4 million to 24 organisations operating in 11 countries across Sub-Saharan Africa, South and South East Asia.

Investment trends

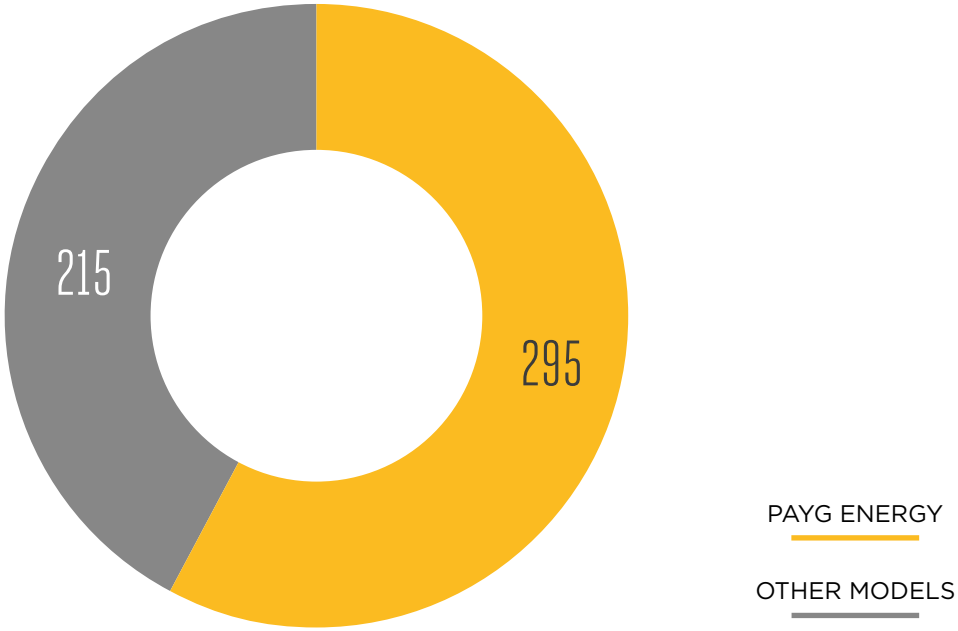
Exponential growth in investment in PAYG energy, but limited in scope

Over the last decade, the amount of investment flowing to organisations in the mobile-enabled utility sector has increased significantly. Industry estimates by Lighting Global show that about USD 511 million has been invested in off-grid solar companies since 2008. Of this, nearly USD 295 million, about 60% of the total funding, was awarded to PAYG energy companies that leverage mobile technology, including mobile money for payment collection, M2M connectivity for remote monitoring and control of assets, and voice, data, and SMS for customer communication.

102. Lighting Global, 2016, "Lighting Global Off-Grid Solar Market Trends Report 2016", https://www.lightingglobal.org/launch-of-off-grid-solar-market-trends-report-2016/
103. GSMA estimate

FIGURE 14

Off-grid solar funding, 2008–2015 (USD million)



As funding for the energy sector has continued to grow, so has the number of commercial investors willing to participate in large debt and equity deals. In 2014 and 2015 alone, PAYG energy companies received over USD 260 million in funding,[104] and 14 of 34 PAYG investment deals had a total value of at least USD 5 million and often involved a consortium of four or more investors. However, of the total amount channelled to the PAYG sector, nearly USD 182 million,[105] about 70% of the total, was directed to the three biggest PAYG energy companies: M-KOPA, Off-Grid Electric, and Mobisol. This occurred in the later stages of funding, indicating the PAYG energy sector is maturing.

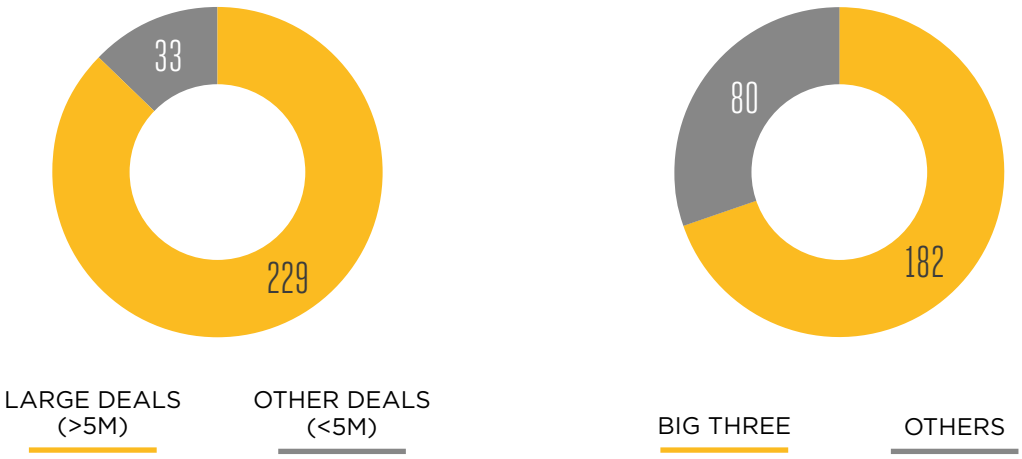
Notably, these three PAYG energy companies have leveraged grant funding to unlock other forms of capital. Mobisol and M-KOPA received funding from the Innovation Fund to scale their existing business models to a new region or product segment. These successes highlight the critical role of grants in spurring innovation: by taking the risk out of early stage enterprises, grants help to attract other forms of capital crucial to achieving scale.

Debt is playing an increasingly important role in enabling PAYG energy companies to meet funding requirements. To achieve scale, PAYG energy companies, which often lease out assets for life or towards ownership, require significant financing to sell products to new customers, while simultaneously servicing old customers prior to receiving the full payments. This financial burden increases with scale. Debt funding provides a suitable channel for investors to finance companies with high potential for repayment, while still allowing company management to retain full control of day-to-day business operations. Several PAYG energy companies, including the big three, frequently raise debt to support business operations and maintain inventory levels to meet existing demand for products.

104. GSMA estimate
105. GSMA estimate

FIGURE 15

PAYG energy funding by size of deal and company, 2014–2015 (USD million)



Over the last few years, mobile-enabled energy companies in Africa have received more funding than those in Asia, with the top-funded PAYG energy companies all based in East Africa. These investment flows are in proportion to the addressable energy markets in these regions.

In Sub-Saharan Africa, close to a third of the total population of 973 million[106] is covered by GSM networks, but does not have access to clean energy. This means a third of Sub-Saharan Africa's population could benefit from mobile-enabled energy delivery. Meanwhile, in the Asia Pacific region, close to a sixth of the total population of two billion[107] has access to GSM networks but no access to clean energy. Here too, ubiquitous mobile technology could be leveraged to deliver mobile-enabled energy products and services. With 370 million people in Sub-Saharan Africa and 367 million in Asia Pacific still not connected to the grid yet covered by mobile networks, there is a huge opportunity for investors to help scale mobile-enabled products and services and close the energy gap in both regions.

In the water and sanitation sectors, we expect to see more commercial investors funding early-stage enterprises with proven business models, in part through "patient capital" such as grants. The biggest beneficiaries of this commercial funding will likely be organisations with highly scalable and easily replicable business models, and which rely on mobile technology to improve efficiencies in resource management, logistics, customer relationship management, billing, and payment collection. For instance, the Innovation Fund's Utility Partnership Grant targets organisations that intend to partner with utilities, given that tackling water and sanitation challenges usually requires the participation of multiple stakeholders. As we have seen in the energy sector, innovative funding models, such as those discussed in the following section, will play a critical role in bridging the funding gaps in the mobile-enabled water and sanitation sectors.

Emergence of crowdfunding

Over the last couple of years, a range of crowdfunding platforms have emerged that allow organisations to raise debt, equity, rewards and donations, or structure revenue-sharing deals. Crowdfunding is being embraced by entrepreneurs across different sectors. The range of funds that can be raised allows less mature businesses, which may not yet be financially sustainable (and hence not attractive to traditional investors), the flexibility to look for the appropriate type and amount of funds they require.

106. World Bank Data 2014: http://data.worldbank.org/region/SSA
107. World Bank Data 2014: http://data.worldbank.org/region/EAP

Crowdfunding has also attracted the attention of donors, such as the DFID. Global Village Energy Partnership (GVEP), with support from DFID, will undertake research on the impact of crowdfunding on energy access and extend support to campaigns.[108]

Another interesting development is the scale of funds being raised through crowdfunding. Kamworks[109] in Cambodia was able to secure a credit line of USD 200,000 through Kiva to fund zero interest loans for consumers to buy their SHSs. Similarly, Sanergy[110] in Kenya was able to raise USD 179,975 from Kiva lenders to offer loans to its network of toilet operators. Re-Volt,[111] through a rewards campaign on Indiegogo, was able to raise USD 40,899 to expand its operations in Haiti.

TEXT BOX 16

BuffaloGrid: 'Mini-IPO' using crowdfunding

BuffaloGrid uses solar energy to recharge mobile phones and provide internet services to off-grid communities. In February 2016, it launched a crowdfunding campaign on Crowdcube to raise funds via equity divestment. The results of this campaign are shown in Table 6.

TABLE 6

BuffaloGrid's Crowdcube campaign

Equity offered	16.93%
Target	GBP 265,000
Funds raised	GBP 496,000
Number of investors	351
Countries represented	23

Daniel Becerra, co-founder and CEO of BuffaloGrid, shared his experience:

"Having the crowd as investors opens many doors. We increased our network, opened potential collaborations in many nations, and gained investors with a wide range of useful skills and contacts. But it is very important to build up momentum as the crowd follows the crowd. Reaching the first 50% of the funding is quite a climb. We were quite lucky to gain the support of DFID and GVEP. The combination of their support and our 50% raise allowed us to have a much better second half of the campaign."

108. Crowd Power: http://www.gvepinternational.org/en/business/crowd-power
109. Kamworks partner page on Kiva: www.kiva.org/partners/407
110. Sanergy's partner page on Kiva: https://www.kiva.org/partners/258
111. Help Bring Clean, Affordable Electricity to Haiti: https://www.indiegogo.com/projects/help-bring-clean-affordable-electricity-to-haiti#/

Although crowdfunding provides a new avenue for funding, it is an extremely resource-intensive process.[112] For entrepreneurs, it is important to consider whether the opportunity cost of implementing such a campaign will be worth the potential funds raised.

Data-driven investment

Mobile technology provides a cost-effective, convenient, and dependable way to collect accurate real-time data on both individual consumers and business operations. For example, transaction data from mobile money accounts is being used to develop credit scores and assess risk. As M2M connectivity is adopted in more developing countries, usage data from connected devices may also become a rich source of reliable data.

Innovative platforms such as SunFunder[113] and Lendable[114] are also using data analytics to assess creditworthiness and facilitate the deployment of capital. To date, SunFunder has provided 23 solar companies with loans worth USD 8.7 million.[115] Its risk-assessment model combines traditional credit assessment metrics, such as cash flow and revenue projections, with data on users' repayment history, mobile recharge data, and other real-time customer data.

The availability of repayment data on asset financing for solar products (from the mobile money accounts of unbanked consumers) has made it possible to adapt traditional financial tools, such as securitisation,[116] in the PAYG solar sector.

112. infoDEV, 2015, "Crowdfunding in Emerging Markets: Lessons from East African Startups", https://www.infodev.org/infodev-files/crowdfunding-in-east-africa.pdf
113. How to borrow: http://sunfunder.com/borrow
114. Joe Brew, 17 May 2016, "The Era of Data", Lendable Blog, http://lendablemarketplace.com/blog/2016/05/17/era/
115. SunFunder, 25 April 2016, "OPIC Approves $15 Million in SunFunder's $50 Million 'Beyond The Grid Solar Fund'", http://blog.sunfunder.com/post/143392489426/opic-approves-15-million-in-sunfunders-50
116. Securitisation is the financial practice of pooling various types of contractual debt, such as residential mortgages, commercial mortgages, auto loans, or credit card debt obligations (or other non-debt assets which generate receivables) and selling their related cash flows to third party investors as securities. See: https://en.wikipedia.org/wiki/Securitization

TEXT BOX 17

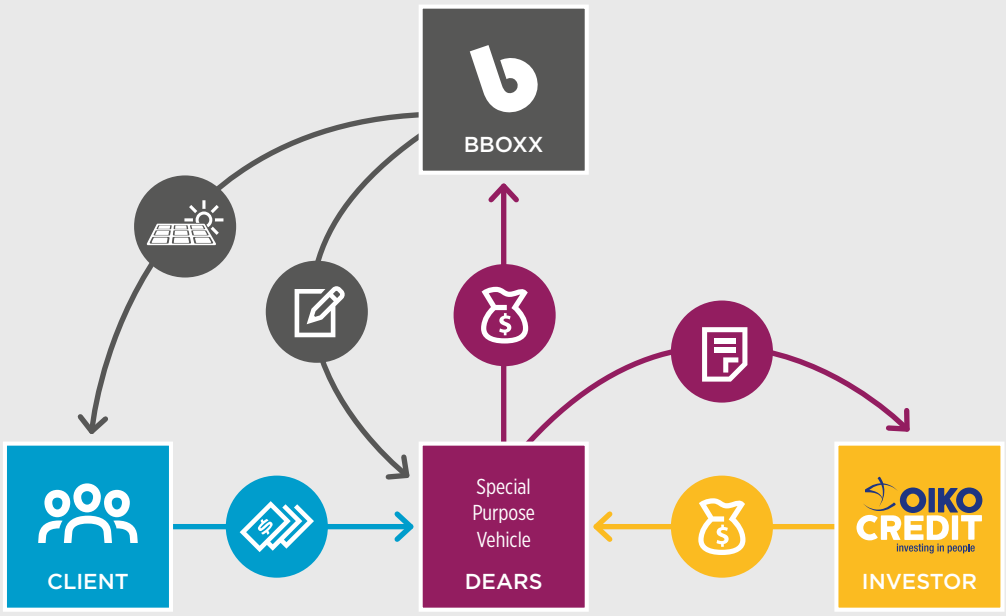
Mobile technology and the securitisation of loans for SHSs

BBOXX, a UK-based company, has been selling PAYG SHSs in developing countries around the world. It has raised USD 500,000 through a securitisation deal with Oikocredit, a worldwide cooperative and social investor providing credit and equity in developing countries. The Oikocredit and BBOXX partnership shows just how mobile technology can ease the deployment of capital. According to David ten Kroode, Renewable Energy Manager at Oikocredit, "This deal has been made possible by the convergence of three things: development and availability of mobile money for payment, reliability of solar systems (in part due to the capability of remote monitoring through M2M connectivity), and a change in consumer behaviour."

Access to real-time data through BBOXX's dashboard has played a major role in this deal, as the loan provided by Oikocredit to the Special Purpose Vehicle (DEARs – Distributed Energy Asset Receivables), is directly linked to repayment associated with 2,500 SHS contracts, as shown in Figure 16.

FIGURE 16 Source: Oikocredit

How the securitisation deal works



The main strength of this model is that it can be easily scaled to increase the number of SHS assets bundled together. It can also be replicated across different markets.

To enhance the investment community's understanding of mobile-enabled business models in the utilities sector, GSMA M4D Utilities has developed case studies that provide in-depth analysis of various business models and operations. The M4D Utilities team would like to continue working with investors to increase the flow of private capital into the sector.

5 Conclusion

The M4D Utilities programme has been striving to establish and institutionalise mobile-enabled energy, water and sanitation access as a key opportunity for the mobile industry to achieve SDGs 6 and 7, while at the same time building commercially sustainable partnerships.

Mobile operators and technologies are at the centre of many off-grid energy and water access success stories. Engaging with the mobile industry and strengthening key enablers can have a phenomenal impact on the utilities sector and make significant progress towards achieving global access to energy, water, and sanitation.

Impressive progress has been made in just the last couple of years. We have seen the PAYG solar sector achieve cumulative sales of 650,000 PAYG solar home systems and attract commercial investments of over USD 295 million. However, the growth of PAYG solar should not overshadow the advancement made in the water sector. Through the M4D Utilities Innovation Fund, we have seen several promising business models emerge that are having real impact and demonstrating sustainability. As described in this report, the ability to collect and analyse data in real time can transform the way utilities operate. The sanitation sector remains nascent, but is trending upwards, with organisations beginning to look at how mobile-enabled technologies can be used to support the sanitation value chain.

DFID have been pioneers in this area, and their support of the M4D Utilities Programme has facilitated trials of 34 new services for energy, water, and sanitation access. Despite significant progress in the sector, we are only scratching the surface of the enormous global challenge. The M4D Utilities Programme will continue to strive to advance innovation, build and share market intelligence, and support the growth of the ecosystem for mobile-enabled utility services for the underserved.

To engage with us, please email m4dutilities@gsma.com

Appendix A – Innovation Fund process

The M4D Utilities Innovation Fund, supported by the DFID, was launched in June 2013 to test and scale the use of mobile to improve or increase access to energy, water and sanitation services. In two phases of funding, over GBP 5.6 million has been awarded through 34 grants to applicants on four continents.

TABLE 7

List of Phase 1 and Phase 2 grantees

Phase	Grantee Name	Type of Grant	Sector	Country	Region
1	African Solar Design	Seed	Energy	Kenya	Africa
1	Development Workshop Angola & SeeSaw	Seed	Water	Angola	Africa
1	Telenor Easypaisa	Seed	Energy	Pakistan	Asia
1	EcoEnergyFinance	Seed	Energy	Pakistan	Asia
1	Emergence BioEnergy	Seed	Energy	Bangladesh	Asia
1	Fenix International	Market Validation	Energy	Uganda	Africa
1	Kamworks	Seed	Energy	Cambodia	Asia
1	M-KOPA	Market Validation	Energy	Kenya	Africa
1	Mobisol	Market Validation	Energy	Rwanda	Africa
1	NextDrop	Seed	Water	India	Asia
1	Lumos	Seed	Energy	Nigeria	Africa
1	Persistent Energy Ghana	Market Validation	Energy	Ghana	Africa
1	Portland State University and Living Water International	Seed	Water	Rwanda	Africa
2	Africa Water Enterprises	Seed	Energy	The Gambia	Africa
2	Brighterlite Norway AS	Seed	Energy	Myanmar	Asia
2	City Taps	Seed	Water	Niger	Africa
2	d.light	Market Validation	Energy	Haiti	LAC
2	Devergy East Africa	Market Validation	Energy	Tanzania	Africa
2	Dialog Axiata	Utility Partnership	Energy	Sri Lanka	Asia

Phase	Grantee Name	Type of Grant	Sector	Country	Region
2	Gham Power	Seed	Energy	Nepal	Asia
2	KopaGas	Seed	Energy	Tanzania	Africa
2	Lilongwe Water Board	Utility Partnership	Water	Malawi	Africa
2	Loowatt	Seed	Sanitation	Madagascar	Africa
2	Manobi	Utility Partnership	Water	Benin	Africa
2	ME SOLshare	Seed	Energy	Bangladesh	Asia
2	Product Health	Seed	Energy	Bangladesh, Kenya, Tanzania	Global
2	Safe Water Network	Seed	Water	Ghana	Africa
2	Sanergy	Seed	Sanitation	Kenya	Africa
2	SMS Energy Services	Seed	Energy	Kenya	Africa
2	SNV	Seed	Energy	Benin	Africa
2	SunCulture	Seed	Energy	Kenya	Africa
2	Upande	Seed	Water	Kenya	Africa
2	Village Infrastructure Angels	Seed	Energy	Vanuatu	Oceania
2	Wonderkid Multimedia	Utility Partnership	Water	Kenya	Africa

Both funding phases were oversubscribed. In Phase 1, applicants asked for GBP 29 million in funding—over 12 times the available amount. In Phase 2, requests increased to GBP 32 million, over 10 times the amount of funding on offer. This indicates mobile is playing an increasingly important role in enabling access to sustainable water, energy and sanitation services, but it also signals the need for more risk capital to develop commercially-viable models.

The objective of the Innovation Fund is to extract insights from testing and scaling innovative models, and to grow the sector by answering three key questions:

- How can mobile support utility services?
- What building blocks are needed for a mobile-enabled solution to be adopted and reach scale?
- What are the social and commercial impacts of delivering community services to underserved mobile subscribers?

In Phase 1, Seed and Market Validation grants were awarded in the energy and water sectors. In Phase 2, a new grant type, Utility Partnership, and a new sector, sanitation, were added. The purpose and maximum award of each grant type (Phase 1/Phase 2) is described below:

Seed grant

- To support the research and development of early stage innovations using mobile to increase or improve access to sustainable energy, water and sanitation services for underserved communities

- Up to GBP 200,000/GBP 150,000 in funding, 25% of total project cost matched by grantee

Market Validation grant

- To support partnerships between MNOs and/or tower companies with utility service providers to scale mobile-enabled business models to increase or improve access to energy, water or sanitation services for underserved communities
- Up to GBP 350,000/GBP 300,000 in funding, 50% of total project cost matched by grantee

Utilities Partnership grant (introduced in Phase 2)

- To support partnerships between a solution provider/innovator and a utility and/or government agency to trial models that use mobile to increase or improve access to energy, water and sanitation services to underserved communities
- Up to GBP 200,000 in funding, 50% of total project cost matched by grantee

TABLE 8

The evolution of the Innovation Fund (Phase 1 to Phase 2)

	PHASE 1 (2013-2015)	PHASE 2 (2015-2017)
CATEGORIES	Seed and Market Validation	Seed, Market Validation and Utility Partnerships
SECTORS	Energy and Water	Energy, Water and Sanitation
**NUMBER OF CONCEPT NOTES	167	218
NUMBER OF ORGANISATIONS FUNDED	13	21
FUNDING AMOUNT PER GRANT	£200k - £350k	£150k - £300k
MATCHING COMPONENT	25% - 50%	25% - 50%
TOTAL AMOUNT DISBURSED	£2.4 Million	£3.2 Million

FIGURE 17

Comparison of Phase 1 and Phase 2 by funding stage, geography and sector

PHASE 1

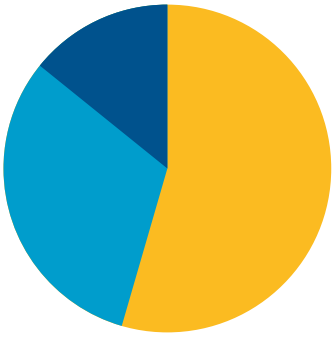
167 CONCEPT NOTES

Asia **65**

Africa **89**

Latin America **7**

Other **6**

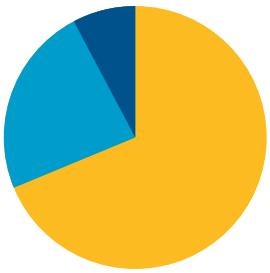


46 APPLICATIONS

Asia **19**

Africa **24**

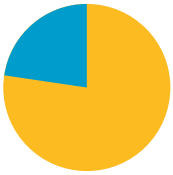
Latin America **3**



13 GRANTS

Asia **5**

Africa **8**



Water | Energy | Energy + Water

PHASE 2

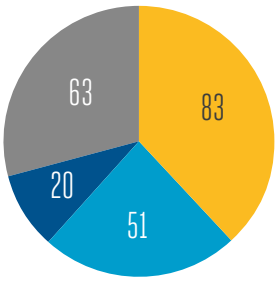
218 CONCEPT NOTES

Africa **125**

Asia **66**

Latin America and Caribbean (LAC) **7**

Other **20**



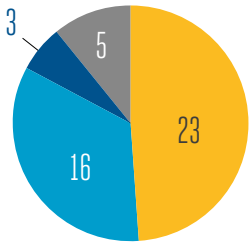
47 APPLICATIONS

Africa **31**

Asia **13**

LAC **1**

Other **2**



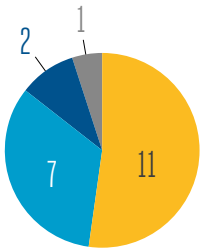
21 GRANTEES

Africa **15**

Asia **4**

LAC **1**

Other **1**



Energy | Water | Sanitation | Multiple Sectors

Appendix B – Glossary

API	Application Programming Interface
ARPU	Average Revenue Per User, generally over a month
CPM	Community Power from Mobile
DFID	The UK Government's Department for International Development
ESCO	Energy Service Company
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
GVEP	Global Village Energy Partnership
IoT	Internet of Things
LPWA	Low Power Wide Area
M2M	Machine-to-machine
M4D	Mobile for Development
MNO	Mobile Network Operator
NGO	Non-governmental organisation
OTC	Over-the-Counter
PAYG	Pay-As-You-Go
SDG	Sustainable Development Goal
SHS	Solar Home System
SIM	Subscriber Identity Module
SMS	Short Message Service

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For more information on the Mobile for Development Utilities programme visit:
www.gsma.com/mobilefordevelopment/programmes/m4dutilities



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