



Mobile for Development Utilities
**Mobile-enabled solutions for improved water
service delivery in Nigeria**



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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.

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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 2016.



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Introduction

In 2015, 663 million people worldwide still lacked access to improved drinking water sources,¹ of which 319 million live in Sub-Saharan Africa.² Both the water supply and service delivery issues need to be tackled to address the water access gap. While water access is lowest in rural areas, in urban areas, utilities' services have been continuously degrading, notably due to lack of network maintenance and investment, as well as a growing urban population. Access to piped water on premises – mainly an urban solution – significantly diminished in Sub-Saharan Africa between 1990 and 2015, from 43 per cent to 33 per cent of the urban population.³ In Nigeria, only 3 per cent of the urban population, or 2.4 million people, has piped connections, compared to 32 per cent in 1990,⁴ or 30.5 million people.⁵

Not only do water utilities serve a very small portion of the urban population but the service is often inefficient, leading both to unsatisfied customers, who are, as a result, less willing to pay, and to higher non-revenue water – i.e. water that is not paid for, due to leakages, theft or inefficient billing. Both the inefficient delivery of water to customers and utilities' revenue losses will continue to grow if they do not improve their operations; and the situation will only worsen as people continue to migrate to urban areas.

In contrast, mobile networks have become the predominant infrastructure and the ubiquity of mobile services presents a growing opportunity for water utilities in urban and peri-urban areas to improve the delivery of water to their customers. In Nigeria, close to 90 per cent of the urban population has mobile coverage.⁶

Mobile-enabled services, from two-way communication services (e.g. SMS reminders, notifications between customers and the utility) to improved management of piped connections (e.g. GSM-enabled machine-to-machine remote monitoring and control of the functionality of the network) and more efficient billing processes (e.g. mobile bill payment), can help water utilities tackle some of their main challenges and reduce non-revenue water losses – which represent 38 per cent of utilities' revenues in Nigeria.⁷ Recovered revenues could, in turn, be re-invested to improve their existing connections and connect more households. Currently, just under 80 million urban dwellers do not have access to a piped water source and revert to non-piped improved water (65 million people) or non-improved water (14 million people) such as wells or surface water.⁸

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1. Improved drinking water is defined by the Joint Monitoring Programme (JMP) as both piped and non-piped water. Piped water on premises is when there is a water connection located inside the user's home. Non-piped water sources are water taps or standpipes, tube wells or boreholes, protected dug wells, protected springs and rainwater collection.
 2. World Bank Joint Monitoring Programme, 2015 Update
 3. Ibid
 4. Ibid
 5. World Bank data, Nigeria's population as of 1990 was 95,617,345
 6. GSMA Intelligence data, Q4 2014
 7. World Bank, "Against the current: How to shape an enabling environment for sustainable water service delivery in Nigeria", April 2015
 8. World Bank Joint Monitoring Programme, 2015 Update

In this light, at the start of 2015, the GSMA Mobile for Development Utilities programme (M4D Utilities), with the support of the UK Government, began working with Etisalat to explore the opportunity for Mobile Network Operators (MNOs) to partner with water utilities and deploy water management solutions to improve their water services for piped connections in Nigeria's urban areas. Based on desk research and field visits, M4D Utilities concluded that, in the short term, the opportunity lies with leveraging mobile services – such as SMS, voice, or mobile applications for complaint management or manual reporting and monitoring – in order to improve customer relationship management and operational efficiencies. In the longer term, as water utilities deploy consumer meters, the market opportunity will grow for MNOs to offer more advanced enabling services, such as remote monitoring and control as well as flexible payment models.

Recommendations to Mobile Network Operators

While the usage of mobile technology for water access is nascent, there is an opportunity for MNOs to engage with water utilities to identify how to improve operational and financial efficiencies in Nigeria. Our recommendations to MNOs are as follows:

- MNOs should take advantage of the nascent market for mobile-enabled water solutions, positioning themselves early on as reliable partners that provide solutions for water utilities' biggest challenges; and
- As partnerships with water utilities grow, MNOs should provide guidance on how to integrate mobile technology into water services, such as machine-to-machine (M2M) and mobile payments, to reduce non-revenue water. Technology providers can also prove critical third party partners, bridging the technical and sector knowledge gaps between utilities and MNOs.

Recommendations to Utilities

While most water utilities in Nigeria are tackling supply issues focused on developing their infrastructure networks, there is an opportunity for more mature utilities, i.e. utilities at a better stage of financial viability, to leverage mobile-enabled solutions to help solve their inefficiencies.⁹ Our recommendations to utilities are as follows:

- The more mature utilities should lead the sector's efforts towards improved water management and begin by integrating simple mobile technology into their processes to provide better communication services to their customers; and
- As water utilities begin to monitor their assets to reduce losses, they should seek to further partner with MNOs, who can provide their technical expertise and tailored management solutions, beyond communication services.

Recommendations to Government

Governments play a critical role in creating an enabling environment to reach universal access for improved water sources. Our recommendations to the Nigerian Government are as follows:

- The Government should push water utilities - State Water Agencies in Nigeria - to adopt a performance-based approach to improve their revenue recovery through technology solutions such as monitoring and billing capabilities; and
- As the business case for mobile-enabled water solutions is being proven, the Government, along with international institutions, donors and investors, have a role to play in financing projects that aim to improve utilities' revenue recovery which in turn give utilities the means to grow their customer base further.

9. World Bank, "Against the current: How to shape an enabling environment for sustainable water service delivery in Nigeria", April 2015

1. The role of mobile for improved urban water access

As MNOs continuously innovate and expand the functionality of mobile networks, they can provide new socially impactful services. Through different channels, MNOs are positioned to offer water utilities far more than simply mobile communications; they stand to be partners that bring secure, integrated services and large-scale network experience.

In Sub-Saharan Africa, where the market for advanced smart solutions is less crowded and where there has been rapid growth of mobile services, MNOs can act as enablers and strong partners for water utilities to improve service delivery and increase connections.

1.1 Mobile channels for water access

In the water access sector, the strongest mobile offering lies in the bundling of mobile enabling services, specifically communication, monitoring and billing services to water utilities:

- **Mobile services:** to improve customer relationship management with two-way communication (e.g. complaint management systems, alerts on water rates, or on shortages) between the customer and the utility;
- **Manual or remote monitoring of water service delivery:** to report, in real or near-real time, on water flow and quality through mobile-enabled sensors / smart meters, mobile apps or SMS; and
- **Mobile billing and payment systems:** to allow flexible, multiple and smaller payments for monthly billing for households as well as to provide an effective tool for water utilities to make improvements in revenue collection.

FIGURE 1

Mobile channels for water access

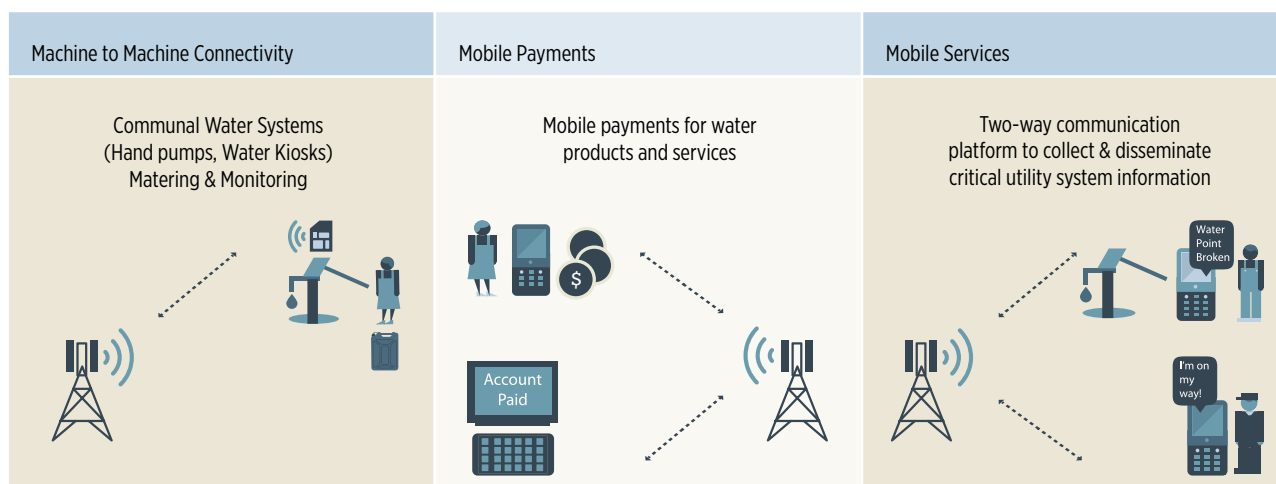


Table 1 summarises use cases in which mobile technology can help tackle some of the main water service delivery challenges utilities face. These will be developed further in section 2 of the report.

TABLE 1

Using Mobile Solutions to Address Water Service Delivery Challenges

Service delivery challenge	Mobile channels for service improvement
Poor monitoring and maintenance of infrastructure leading to high technical and non-technical losses	<ul style="list-style-type: none"> • Mobile services (voice/SMS/data/mobile application): for manual reporting of functionality, leaks or theft; and • GSM-enabled M2M technology: Automated remote monitoring of a system's functionality, leakage and/or volume in real time using mobile-enabled sensors for standpipes and smart meters for networks.
Weak cost recovery leading to limited investment in operations and maintenance	<ul style="list-style-type: none"> • Mobile payments: to allow flexible tariff structure and payments; and • Mobile applications: to allow accurate meter reading and improved billing.
Lack of water quality control and customer dissatisfaction	<ul style="list-style-type: none"> • Mobile services: Manual reporting of water quality by trained users through testing kits; • Mobile services: Two way communication, providing reminders, notifications, and bills to improve customer's satisfaction; and • GSM-enabled M2M technology: Automated, remote, reporting and monitoring of water kiosks' treatment processes.
Poor internal governance	<ul style="list-style-type: none"> • Mobile services or GSM-enabled M2M technology: Manual or digitised data collection for increased transparency that leads to more responsive stakeholders¹⁰.

10. World Bank, "Against the current: How to shape an enabling environment for sustainable water service delivery in Nigeria", April 2015

The World Bank and the Government of Nigeria have shifted their strategy on how to solve water access issues. Instead of solely focusing on installing or rehabilitating networks, the priority is now on a holistic measurement of service delivery, in terms of reliability, sustainability and quality. As more utilities

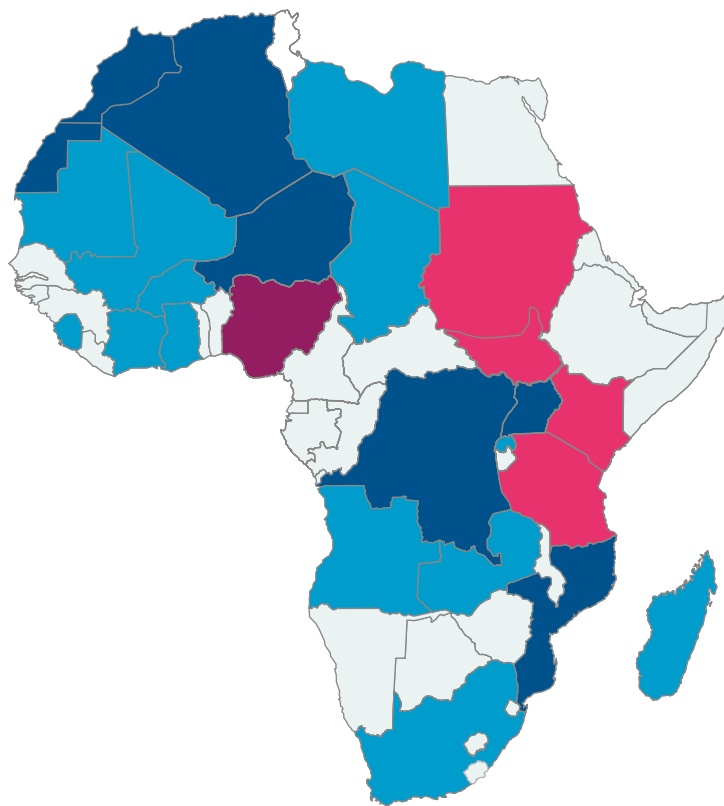
undergo this strategic shift, more uses of mobile for monitoring service delivery will be trialled, best practices will emerge, and sustainable solutions will scale, thus strengthening the case for mobile-enabled water services in Nigeria and the wider West Africa region.

1.2 Nigeria’s urban water addressable market

Nigeria has an urban population of over 83 million people¹¹ who is largely covered by mobile networks, yet only 3 per cent have access to piped water networks. There is a strong opportunity to leverage the ubiquity of mobile to help utilities efficiently reduce their non-revenue water losses through innovative mobile-enabled solutions. In the longer term, utilities could re-invest their recovered revenues to connect the remaining ~80 million urban dwellers¹² who currently have either access to non-piped improved water sources, such as wells and water pumps, or access to non-improved water sources, such as surface water, canals or unprotected wells.

MAP 1 Source:GSMA

Overview of the water addressable market in Africa (2013)



>30 MILLION 9-16 MILLION 4-8 MILLION 1-3 MILLION BELLOW 1 MILLION

11. Urban population represented 47 per cent of the total population (177,000,000) World Bank, 2014
 12. World Bank Joint Monitoring Programme, 2015 Update

2. Nigeria: country overview

2.1 Geography

Located in Western Africa, the Federal Republic of Nigeria shares its borders with four countries: Benin, Niger, Chad and Cameroon. The Niger River runs through the south of the country, which is characterised by tropical weather, while the north

of the country is arid. The country is divided into six geopolitical zones (North-Central, North-East, North-West, South-East, South-South, and South West) and 36 states, plus one Federal Capital Territory.

MAP 2 Source: MAGELLAN Maps

Nigeria



2.2 Socio-economics & demographics

Nigeria is considered the powerhouse of Africa in terms of population and GDP, with over 177 million people and a GDP estimated at 80.2 trillion Naira (USD 500 billion)¹³, compared to neighbouring countries such as Senegal

and Côte d'Ivoire (Table 1). Despite its considerable wealth, the country is ranked low on the Human Development Index (152 out of 187), with 62 per cent of the population living on less than USD 1.25 a day.¹⁴

TABLE 2

Key regional indicators

Indicator	Nigeria	Côte d'Ivoire	Senegal
Population (millions) ¹⁵	177.5	22.16	14.67
GDP per Capita (current USD) ¹⁶	3,184.6	1,521	1,072
HDI Ranking ¹⁷ (out of 187 countries)	152	171	163
Rural population (%) ¹⁸	54	47	57
Population living on less than USD 1.25/day (%) ¹⁹	62	35	34.1

Note: Senegal and Côte d'Ivoire were selected to provide a regional comparison with Nigeria.

13. GIZ report, 2014 <http://www.giz.de/en/downloads/giz2014-en-nigerian-energy-sector.pdf>

14. World Bank, 2010

15. World Bank, 2014

16. Ibid

17. UNDP Human Development Index, 2014

18. World Bank, 2014

19. World Bank, 2010

2.3 Telecoms

GSM coverage and mobile statistics

As Table 3 shows, Nigeria largely has 2G coverage (87.2 per cent), with the exception of remote areas, in the far east and north, while 3G coverage is concentrated in urban centres (50.84 per cent of the population).²⁰ While population coverage is extended, market penetration by unique subscribers is 47 per cent, with approximately 86 million Nigerians owning a mobile phone.

The country's telecom market is competitive with seven MNOs: MTN is the market leader with 43 per cent market share, followed by Glo Mobile (20 per cent), Airtel (19.8 per cent) and Etisalat (15.4 per cent). Smaller Code Division Multiple Access (CDMA)²¹ players, Visafone and Multi-Link have market shares of less than 1 per cent each and are beginning to exit the market, which is consolidating the sector.²²

TABLE 3

Regional mobile statistics²³

Mobile indicators	
GSM Connections, excluding M2M	144,642,123
Unique subscribers	82,616,058
Market penetration, by unique subscriber	45.33%
2G Network coverage	87.2%
3G Network coverage	50.84%
Mobile money service providers	19
M2M connections	1,592,781

Mobile money services

There are 19 licensed mobile money service providers, comprising of banks and non-banks, in Nigeria. Despite having the highest number of mobile money service providers in the world, Nigeria has just under 13 million

mobile money accounts,²⁴ which is relatively small, especially in view of the mobile market penetration.

The Central Bank of Nigeria's regulatory framework, allows two models of mobile financial services – bank led and non-bank led – but specifically excludes MNOs

20. GSMA Intelligence data, Q1 2015

21. Code Division Multiple Access. A technology used for some 2G and 3G mobile communications.

22. GSMA Intelligence data, 2015

23. Ibid

24. GSMA Mobile Money deployment tracker, 2015

from providing mobile financial services, limiting their role to the provision of the channel through which other providers' mobile money services can be offered. This situation has invariably resulted in under-investment in mobile money by MNOs, and consequently, limited customer adoption levels. GSMA's annual global adoption survey of mobile money services has consistently shown that among the group of the fastest growing mobile financial services, the vast majority are driven by MNOs.

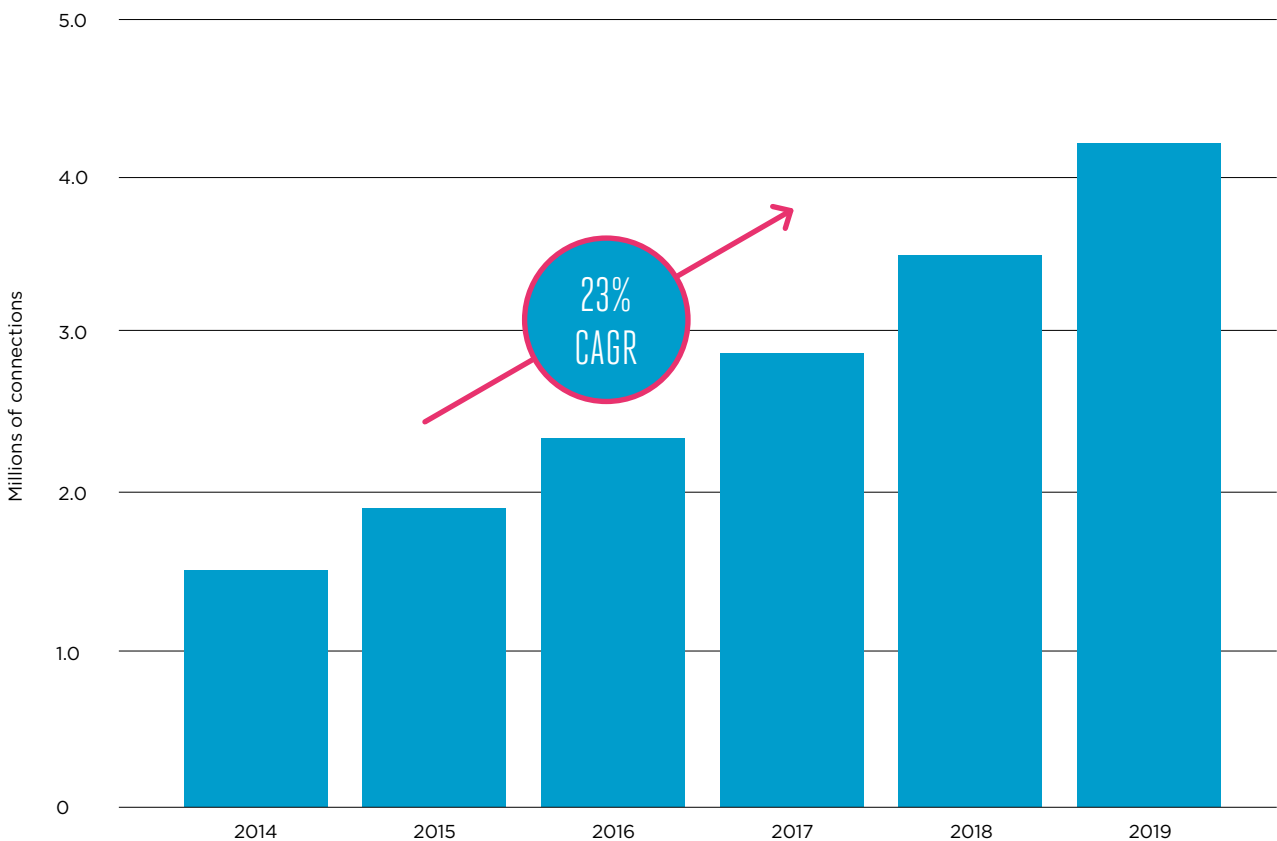
While electricity utilities offer a mobile bill pay service (pre and post-paid), via a mobile application, water utilities have not yet followed suit, in part due to the fact that metering infrastructure is not yet in place.

Machine-to-Machine: a nascent market

GSM M2M technology “connects machines, devices and appliances together wirelessly via a variety of [mobile] communication channels, including SMS, to deliver services with limited direct human intervention.”²⁵ The main M2M services that are currently implemented in Nigeria are fleet management, security monitoring or point-of-sale machines.²⁶ There has been a limited progress towards more advanced M2M applications such as smart metering due to connectivity, implementation and cost issues. As a result, only 30 per cent of total enterprises in Nigeria have implemented M2M technology.²⁷

FIGURE 2

Growth of M2M connections in Nigeria (2014 - 2019)²⁸



25. GSMA Intelligence report, “Global cellular M2M technology forecasts and assumptions,” March 2015

26. International Data Corporation, 2014

27. Ibid

28. GSMA Intelligence data, 2014

However, as Figure 2 shows, despite this slow start, M2M services are growing in Nigeria with approximately 1.5 million M2M connections in 2015 (-11 per cent of total M2M connections in Africa)²⁹ and an expected 4.2 million connections by 2019. This growth opens up the potential

for M2M-enabled devices, such as smart meters, to provide real-time data on customer consumption and equipment performance. While this opportunity is maturing in the energy sector, most State Water Agencies are in the early stages of metering customers.

2.4 Water access

Nigeria made significant efforts towards achieving the Millennium Development Goal for drinking water,³⁰ with more than 50 million people gaining access to improved water sources since 1990. Today, 69 per cent of the national population, or approximately 120 million people, have access to improved water sources. However, in urban areas, increase in water access has been slow – from 76 per cent of the population in 1990 to 81 per cent in 2015³¹ – and mainly led by the growth of non-piped connections. With the degradation of piped networks and the country's rapid urbanisation (Nigeria's cities are expected to grow by 200 million people in the next 40 years³²), the need to tackle the urban water access gap and water utilities' inefficiencies has become critical.

Urban improved water sources

In urban areas of Nigeria, there are three main models of water sources: piped, non-piped and unimproved, as illustrated in Figure 3. The main source of water

is non-piped improved water, such as water taps or standpipes, boreholes, protected springs and rainwater collection, which represents 78 per cent of used water sources. The second most used source is unimproved water such as unprotected wells, springs and surface water, representing 16 per cent of used water sources. The least used source is piped water on premises (where water connections are located in the user's home) and surface water, accounting for 3 per cent of used water sources.³³

The alternative for people who only have a few hours of running water or none at all (in 2004, 50 per cent of Nigerians living in urban areas lacked piped water access³⁴) is to resort to private vendors who sell water at ten to hundreds of times the price of public state water.³⁵ In some states, private vendors serve up to 30 per cent of the urban population and the informal market is estimated at USD 700 million per year.³⁶ These figures highlight the opportunity cost to utilities of operational and financial inefficiencies.

29. GSMA Intelligence data, Q1 2015

30. The MDG target called for the proportion of the population without sustainable access to safe drinking water to be halved between 1990 and 2015.

31. World Bank Joint Monitoring Programme, 2015 Update

32. United Nations World Urbanization Prospects, <http://esa.un.org/unpd/wup/Highlights/WUP2014-Highlights.pdf>

33. World Bank Joint Monitoring Programme, 2015 Update

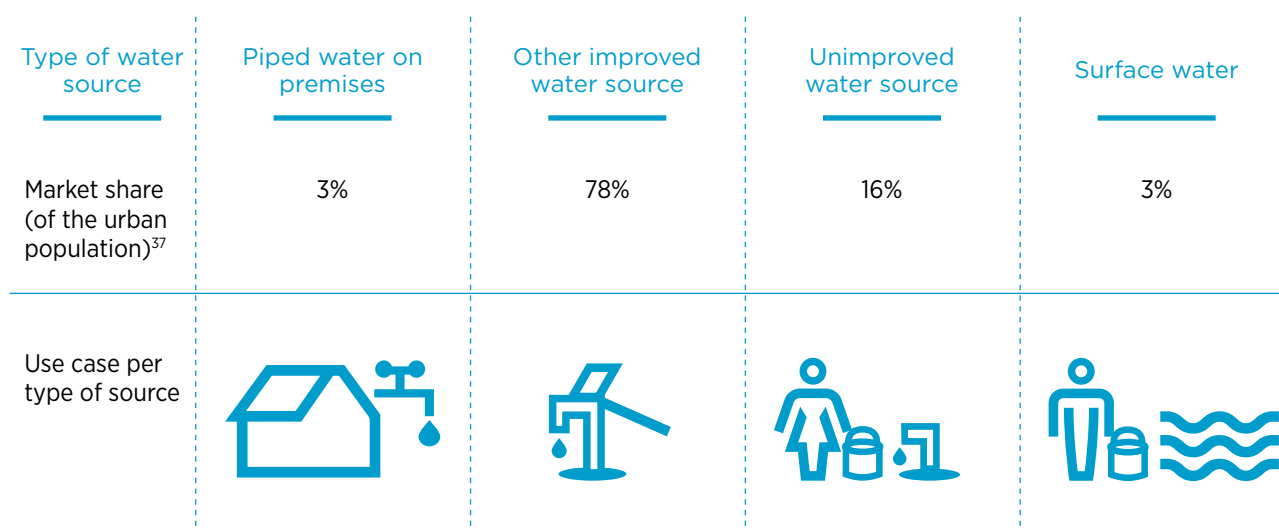
34. Ibid

35. World Bank, "Against the current: How to shape an enabling environment for sustainable water service delivery in Nigeria," April 2015

36. Ibid

FIGURE 3

Urban water sources



Key actors and urban water access initiatives in Nigeria

Federal Ministry of Water Resources

The Federal Ministry of Water Resources is responsible for the overall management of water supply and sanitation while State Water Agencies (SWA) – owned by the Government – are in charge of operations and maintenance of urban and semi-urban water supply systems. The Ministry formulates policies, collects data, conducts research and development, as well as funds water projects.

Water access policies in Nigeria

Several policies have been implemented to improve water service delivery in Nigeria, with mixed results, notably:

- The National Water Supply and Sanitation Policy, which encourages private sector participation and works to improve SWAs' efficiencies; and
- The Presidential Water Initiative “Water for People, Water for Life”, which aims at increasing

access by 100 per cent in state capitals, 75 per cent in other urban and peri-urban areas and 66 per cent in rural areas.³⁸

Despite these policies, losses observed today suggest that there is still much to do for SWAs to reduce their losses and recover revenues.

Donor involvement

In addition to the work done by the Government and State Water Agencies, international development agencies play an important role in Nigeria's water access sector, especially as the State's resources are often limited. Some of the principal actors include the United Kingdom's Department for International Development (DFID), the United Nations, the African Development Bank (AfDB), the World Bank, the Japan International Cooperation Agency (JICA), the Government of China, and the European Commission (EC).³⁹ These agencies support the implementation of policies and provide monitoring on performance of utilities' capabilities.

37. World Bank Joint Monitoring Programme, 2015 Update

38. USAID, Nigeria: Water and Sanitation Profile, http://pdf.usaid.gov/pdf_docs/PNADO937.pdf

39. USAID, Nigeria: Water and Sanitation Profile, http://pdf.usaid.gov/pdf_docs/PNADO937.pdf

State Water Agencies

There are 37 State Water Agencies (SWAs) in the country – one for each state and one in the Federal Capital Territory of Abuja. Although Government-owned, they operate autonomously, each one managing their water supply facilities and responsible for their own financing.

State Water Agencies' main challenges

In Nigeria, the operational efficiency of most State Water Agencies is very low, as unaccounted-for water often

exceeds 50 per cent of production.⁴⁰ SWAs' urban water access challenges are several fold, and include :

- Old water and wastewater networks and poor maintenance;
- Weak financial performance;
- Limited institutional capacity and governance; and
- Intermittent power supply.

Table 4 covers some of the challenges faced by SWAs in delivering water to the urban population of Nigeria.

TABLE 4

Urban water service delivery challenges

Service Delivery Challenge
<p>Poor monitoring and maintenance of infrastructure leads to high technical and non-technical losses</p> <ul style="list-style-type: none"> • Piped networks lack real time monitoring to detect leakage, and theft, as well as to ensure an equitable distribution to all customers; • Remote hand pumps and boreholes remain broken for long periods without an active maintenance programme; and • Reliance on manual field reporting and lack of IT systems – usually using excel sheets filled in manually and prone to errors.
<p>Weak cost recovery leads to limited investment in operations and maintenance</p> <ul style="list-style-type: none"> • Inability of some consumers to pay large monthly water bills; • Limited access to in-person pay points; and • Cash collection not transparent.
<p>Lack of water quality control and customer dissatisfaction</p> <ul style="list-style-type: none"> • Absence of water quality monitoring and dissemination of information to consumers; and • Limited information shared between SWAs and customers, further undermining repayment rates.
<p>Poor internal governance</p> <ul style="list-style-type: none"> • Fragmentation of the water market between different stakeholders leads to poor data sharing or data loss; • Uneven commitment from SWAs results in vast disparities in rates of access to water supply services across states: from 81% in Lagos state, to 13% in Sokoto state, to 97% in Kano⁴¹; and • Lack of funding and need for strategic investment.

40. World Bank, "Against the current: How to shape an enabling environment for sustainable water service delivery in Nigeria", April 2015

41. Ibid

Changing mindsets of both customers and State Water Agencies

Water for free?

In addition to the low willingness to pay due to SWAs' inefficiencies, customers commonly expect water to be free, undermining further cost recoveries. However, the average urban household spends between 4 per cent and 18 per cent of its total income on water supplied by private wells, boreholes and street vendors,⁴² highlighting the fact that efficiency is the bigger problem.

Switching to customer-oriented solutions

The current corporate culture of SWAs also needs to change to ensure optimal delivery of water services. Water utilities need to update their business practices, moving away from a "lack of performance culture"⁴³ which undermines reform and the ability of SWAs to recover revenue.

42. World Bank, "Against the current: How to shape an enabling environment for sustainable water service delivery in Nigeria", April 2015

43. Ibid

3. Mobile-enabled water solutions for Nigeria

As highlighted at the beginning of the report, mobile technology could help in addressing some of these utilities' operational and financial challenges. While most of Nigeria's SWAs are not yet focused on leveraging mobile technology to improve their operations, a shift is happening. A few water utilities are progressively placing a new focus on improving the efficiency of existent infrastructure before developing new networks.

The opportunity for mobile-enabled water solutions is significant in view of the size of the addressable market but will require the development of a stronger ecosystem of innovators and MNOs, more educated on the market opportunity, to support water utilities in the implementation of mobile technology. A transitional approach, beginning with light-touch mobile services such as complaint management systems via calls or SMS, will provide the best returns and lay the basis for strong partnerships between MNOs and utilities. Along with a shift in mindset, the ecosystem of water stakeholders – utilities as well as technology service providers – needs to be committed to the water access market for mobile-enabled water solutions to scale in Nigeria.

3.1 A nascent opportunity for water utilities

From an infrastructure focus to improving service efficiency

In the last 15 years, the World Bank has been heavily involved in tackling water utilities' challenges in the region and in Nigeria. They first addressed the need for infrastructure development before considering addressing utilities' operational inefficiencies. In 2004, the first National Urban Water Sector Reform was implemented, representing a first shift away from infrastructure rehabilitation projects, and emphasising instead the reliability and financial viability of water

utilities' current networks in Enugu, Ogun and Kaduna states.⁴⁴

Today, the third National Urban Water Sector Reform Project⁴⁵ responds to the Government of Nigeria's goal of developing more effective mechanisms for social service delivery, particularly water services, as a means to address inequities in income and opportunities. This strategy intends to eliminate the vicious cycle of inefficiencies as presented in the National Water Resources Strategy document: "there has been no water resource management in Nigeria to this point,

44. These SWAs were selected partly due to geopolitical reasons, representing different regions of the country. Kaduna made significant improvements in some areas

45. World Bank

only a top down, supply-driven, development of water resources. This has led to investments which have not been effectively utilized, representing a major waste of Government funding which continues until today. The result has been a vicious cycle of unreliable projects that provide services that do not meet consumer needs and for which the consumers are unwilling to pay.”⁴⁶ The World Bank has approved a credit of USD 250 million from the International Development Association (IDA) to help the Nigerian Government continue its efforts in increasing access to water supply services and improve the financial and management viability of existing water utilities.⁴⁷

Following the energy sector’s technology revolution

The energy sector has gone through a more rapid technology revolution than the water sector, which explains in part the stronger uptake of mobile technology for improved energy access in urban settings, such as mobile payment for energy bills or M2M technology for metering.

Currently, urban customers can pre or post-pay for their grid electricity in Nigeria, using their phone. Post-paid payments can be done either at banks, shops, online, through the electricity company’s own mobile application or through the MNO’s mobile money menu. For pre-paid transactions, customers can top up their meters using a recharge card or mobile money. Water utilities could follow the same course and begin to leverage MNOs’ mobile money services and allow their customers to pay their water bills remotely, through their phones.

With regards to the use of GSM-enabled M2M technology, until now the focus has been on fleet management, security, Point-of-Sales/ATM connectivity and less so on the utilities sector. However, there have been early GSM-enabled metering pilots, suggesting a shift towards the use of smart metering technology to ensure more efficient water services. This shift will likely be replicated in the water sector as SWAs begin to focus on improving their operations.

46. Water and Sanitation Program

47. World Bank, 2014

Potential target utilities for the deployment of mobile-enabled water solutions

In light of the nascent mobile-enabled water market and utilities' current challenges, identifying those water utilities – SWAs – which could invest in technology to improve their efficiencies is a difficult task and requires further investigation into each utility's capabilities. Table 5 gives an initial understanding of where the opportunity is strongest, evaluating the States representing 60 per cent of the population on the basis of their water coverage, collection ratios and non-revenue water.

TABLE 5 Source: IBNET 2015

Target water utilities with the highest losses

States	Total Pop (2013)*	Population Served	Water Coverage (%)	Collection Ratio (%)	Non-Revenue Water (%)
Kano	11,087,800	2,484,959.96	50.00%	53.18%	65%
Lagos	10,694,900	6,232,011.23	32.34%	40.43%	45%
Kaduna	7,102,900	1,752,209.96	77.22%	34.14%	27%
Katsina	6,740,500	675,599.98	40.24%	86.62%	78%
Oyo	6,615,100	1,377,683.96	45.92%	12.04%	23%
Rivers	6,162,100	107,152.00	10.65%	0.15%	31%
Bauchi	5,515,300	259,398.01	54.96%	14.02%	49%
Jigawa	4,942,100	4,634,738.77	99.99%	35.52%	22%
Delta	4,826,000	1,438,181.03	30.00%	40.83%	70%
Anambra	4,805,600	296,880.00	38.61%	23.74%	36%
Niger	4,687,600	417,226.01	10.55%	85.34%	0%
Akwa Ibom	4,625,100	917,340.03	40.75%	61.98%	15%
Imo	4,609,000	222,248.00	5.66%	3.65%	37%
Ogun	4,424,100	1,338,814.94	44.64%	31.78%	72%

Kaduna and Ogun, both SWAs with high non-revenue water (27 per cent and 72 per cent, respectively) and low collection rates (34 per cent and 31 per cent, respectively), were monitored by the World Bank to evaluate their efforts in improving their efficiencies. While considered more mature in terms of improving

their operational efficiencies, Kaduna and Ogun SWAs have not yet leveraged mobile technology, whether simple mobile services or M2M technology, to improve efficiencies and still operate in a traditional way, as Kaduna's case study below highlights.

Case of Kaduna State Water Agency: Tackling efficiency challenges⁴⁸

Kaduna's State Water Agency was selected in 2004 by the World Bank to undergo the new National Urban Water Sector Reform Project, along with Enugu and Ogun's SWAs. The aim was to increase access to piped water supply in urban areas through investments in improving the reliability and financial viability of these selected areas.

Changes in management structures, notably a reinforcement of performance-driven assessment of staff, were critical to improve the operational and financial efficiencies and allowed the SWA to decentralise decision-making and funding at the state level. Some of these changes led to operational improvements, and further incentives were given to staff to ensure the longevity of these changes, including rewards to high-performing staff and training to motivate performance-driven management. Data started to be collected to provide insights on performance, to create plans that ensured the SWA's sustainability, and to help the utility convince politicians to allow for greater autonomy to undergo reforms and improve revenue recovery. One of the key learnings from Kaduna's new approach is that data is an efficient tool for obtaining political support and keeping staff focused on performance.

The project brought improved water sources to 70,846 households in all three States. In Kaduna, 2.4 million additional urban dwellers were connected to a piped water source during the lifetime of the project. The SWA also recovered 85 million Naira in cash flow (~USD 430,000) by the end of the project and collection efficiency⁴⁹ improved by 85 per cent by 2013.

3.2 Barriers to market entry

The opportunity to leverage mobile technology to improve water service delivery is still very nascent. There is a solid potential, in the medium to long term, for MNOs to play a role in supporting water utilities, as the current barriers to entry reduce and both the water sector and mobile market mature in Nigeria.

Maturity of the water sector

Asset monitoring through metering of customers, although acknowledged as a solution to many utilities' challenges, has not been implemented in Nigeria, in part due to bureaucracy: "The distribution of meters

can threaten vested interests and allow for new rents to be made. Solving a technical problem may be tangled up with other interests favouring the current service delivery model which is dominated by informal service providers and private vendors".⁵⁰

Other governance issues exist and internal reforms are required for State Water Agencies, incentivised by the Government, to adopt performance-driven services. Most water utilities in Nigeria are currently focused on building their infrastructure network to address their low supply of water before considering using technology to optimise their service delivery.

48. World Bank, "Against the current: How to shape an enabling environment for sustainable water service delivery in Nigeria", April 2015

49. Collection efficiency (per cent) is defined as the ratio of revenue collected to amount billed

50. World Bank, "Against the current: How to shape an enabling environment for sustainable water service delivery in Nigeria", April 2015

Finally, technology service providers focused on the water sector appear to be less present in Nigeria. This could limit the opportunity for mobile solutions to scale if there are no providers efficiently implementing technology solutions in this sector.

Maturity of the mobile market

Mobile money is one of the strongest propositions to tackle water utilities' inefficiencies around collection and billing systems, as examples in East Africa show. However, the maturity of mobile money is not as evenly spread across the Sub-Saharan African region,

limiting the impact of this service. This is the case in Nigeria where mobile money services have yet to fully take off.

In the longer run, M2M could become an important part of the mobile value proposition for water utilities, offering real-time data and remote monitoring and control solutions. Although more MNOs are entering the M2M market in view of the significant opportunity (an estimated 25 billion devices could be connected globally through M2M by 2020⁵¹), there is still a need for them to better define their offering if they wish to enter into impactful partnerships with water utilities.

3.3 Examples of mobile-enabled water solutions across the region

While the market for mobile-enabled water solutions is still immature in Nigeria, some examples show how these solutions successfully improve water utilities' operations across the region, which could be replicated in Nigeria.

Using mobile money to pay for water services in Kenya

Nairobi City Water and Sewerage Company has developed a self-metering solution (Jisomee Mita) that allows customers to submit their meter readings via SMS, query their balance and use Safaricom's mobile money payment platform, M-PESA, to pay for their water consumption. After a year of service, approximately 4 per cent of customers were using Jisomee Mita and the utility has since expanded its service, partnering with another Mobile Network Operator, Airtel, to offer free bill payment for their customers. Since the self-reading solution has been put in place, revenue collection in Kayole Soweto, the pilot area, has improved from USD 2,000 to 10,000 per month.

Piloting GSM-enabled M2M water usage monitoring in South Africa

Mobile operator MTN has developed a Business Water Usage Monitoring solution for water utilities. Their system is web-based, meaning that data can be accessed from any device with an internet connection. The utility's staff can view and monitor a number of sites, and receive information on the total monthly water consumption, the number of anomalies detected and solved, as well as those that remain unsolved, and the estimated monthly savings on water bills. Their results suggest significant savings for their partners: a pilot test that was conducted on a company that was losing 21,000 litres of water a day from a leak and paying a R 400,000 (USD 30,800) bill every month as a result, would have an estimated yearly saving of R 3.5 million (USD 270,000) using the monitoring platform.⁵²

51. GSMA Intelligence, Global cellular M2M technology forecasts and assumptions, March 2015

52. Interview with Kevin Jacobson, General Manager, Business Indirect Sales, and Nomalanga Nkosi, General Manager, Business Marketing, MTN Business, Metering.com, May 2012 <http://www.metering.com/m2m-set-to-change-the-way-a-multitude-of-industries-operate-including-electricity-and-water/>

A mobile application to improve water management in Senegal

Solutions implemented in rural settings can also be relevant in urban areas. Manobi developed a mobile phone-based performance monitoring system, mWater, enabling rural water service providers to facilitate the monitoring of piped water schemes and improve operations in West Africa. The mWater application installed on a feature phone or smartphone allows water scheme managers to forward weekly information about performance, with data being uploaded online. Information includes savings and current accounts and the number of days when the service is not available. Agents can also report system malfunctions directly through SMS to the maintenance operator. The mWater service is available in Senegal, Niger, Mali and Benin.

Source: GSMA



4. Opportunity for MNOs to partner with water utilities

As shown at the start of the report, there are three main mobile channels that can be leveraged to improve water access: mobile communication services; mobile payment and machine-to-machine services (Figure 1). As the use of mobile technology for water services is new in Nigeria, the solution that holds the most immediate potential for success is a mobile communication service between utilities and end users. This two-way communication service not only has the best guarantee of success in the current market as it is relatively simple to put in place, it also replaces the current inefficient and non-automatised complaint management service (i.e. where the customer goes to the utility's branch to make a complaint), and in turn could result in improved customer loyalty and repayments for the utility. The main immediate benefit for MNOs will be to facilitate access to an essential service and retain customers on their network.

In the longer term, as the sector evolves and utilities adopt mobile technology to improve their efficiency, MNOs should offer new services such as mobile payment for bills or M2M for remote monitoring. In turn, MNOs would benefit from increased mobile data traffic, mobile money transactions as well as creating new revenue streams.

4.1 Short term benefits: Reduce customer churn

Customer loyalty is a critical point for MNOs, especially in a market where customers shift very easily from one operator to the other. According to a University of Oxford study on mobile water payments in Africa, 33 per cent of revenue generated by MTN Mobile Money

in Uganda was the result of a reduction in customer churn. In line with this finding, both Vodacom and Airtel in Tanzania viewed mobile water payments more as an opportunity to build customer loyalty rather than a means to directly drive revenue.⁵³

53. University of Oxford 2012, <http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2012/03/Mobile-Water-Payment-Innovations-in-Urban-Africa.pdf>

4.2 Long term benefits: drive growth in mobile money adoption and use

Mobile water payment services can become part of MNOs' key offering to water utilities to drive the growth in mobile money adoption and use. As a predictable monthly transaction, the water bill payment option is a natural fit within a mobile money provider's suite of products. The revenue generated by the mobile water payment option will vary by agreement, as an example, for an average water bill

paid via mobile money, MTN in Uganda would receive USD 0.09, while Vodacom would earn USD 0.64 in Dar es Salaam, and Safaricom would take in USD 0.30.⁵⁴ There is potential for new revenues from mobile water bill pay, however this service would not be fully functional unless customers are equipped with meters – either smart or analogue – for accurate reading and billing services.

4.3 Long term benefits: Increasing data traffic and number of connections

Offering a connectivity platform for water utilities to transfer data on customer consumption, water quality, systems' operations – remotely (M2M connection) or manually (SMS, voice, mobile app) will require customers to have meters installed in their houses, at the point of connection. While some of the more

advanced utilities are considering metering their customers - residential and commercial – the roll out is not yet fully underway. It will take time before MNOs can efficiently provide these solutions to water utilities and in turn increase the mobile operator's number of connections, as well as data traffic.

54. University of Oxford, 2012, <http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2012/03/Mobile-Water-Payment-Innovations-in-Urban-Africa.pdf>

5. Conclusion

Nigeria's urban water sector faces several significant challenges as State Water Agencies are unable to provide a reliable service to their customers. Moreover, as Nigerians continue to migrate to cities, SWAs will increasingly suffer from operational and financial losses. Examples of successfully implemented mobile-enabled water solutions across Sub-Saharan Africa reveal the potential for mobile technology to help efficiently tackle these challenges in Nigeria, given the right environment. Early efforts from a few SWAs to improve their operational efficiency signal a performance-driven approach, in which mobile-enabled water solutions will have an important role to play. Joint collaboration from the broader ecosystem of players, including MNOs, water utilities, technology providers and the Government, will create a conducive environment to tap into the significant opportunity to improve water services in urban areas of Nigeria.



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



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