



## Scaling Digital Solutions in the Water Sector Lessons from CityTaps and Wonderkid

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## Mobile for Development Utilities

The Mobile for Development (M4D) Utilities programme improves access to basic energy, water and sanitation services in underserved communities using mobile technology and infrastructure. Our work encompasses any energy, water and sanitation service provided to a community, which includes a mobile component, whether it is voice, SMS, USSD, Machine-to-Machine, NFC, a mobile operator's agent network or tower infrastructure. We aim to seize the opportunity, leveraging mobile technology and infrastructure to enhance access to affordable and reliable energy, clean and safe water and sanitation services in underserved communities. The GSMA M4D Utilities programme is funded by the UK Foreign, Commonwealth & Development Office (FCDO), and supported by the GSMA and its members.

For more information, please contact us:

Web: [www.gsma.com/m4dutilities](http://www.gsma.com/m4dutilities)

Email: [M4DUtilities@gsma.com](mailto:M4DUtilities@gsma.com)

**Authors:** Catarina Morais, GSMA / Zach White, GSMA

**Contributors:** Ilana Cohen, GSMA / George Bauer, GSMA / Phillip Ramgobin, GSMA

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## CONTENTS

<b>EXECUTIVE SUMMARY</b>	<b>4</b>
GSMA Mobile for Development Utilities Innovation Fund grantees	6
<b>1 INTRODUCTION</b>	<b>8</b>
1.1 Digital solutions in the water sector	9
1.1.1 Scaling digital innovations for water services	12
1.2 Focus of the research	14
1.2.1 Approach	14
1.2.2 The Kenyan water sector	14
<b>2 JOURNEYS TO SCALE</b>	<b>15</b>
2.1 Wonderkid	16
2.2 CityTaps	18
<b>3 ENABLERS AND BARRIERS TO SCALE</b>	<b>21</b>
3.1 Ideation	23
3.2 Validation	24
3.3 Iteration, refinement and scaling	25
3.4 Looking forward: widespread adoption	28
<b>4 ACCELERATING DIGITAL ADOPTION IN THE WATER SECTOR</b>	<b>29</b>

# Executive Summary

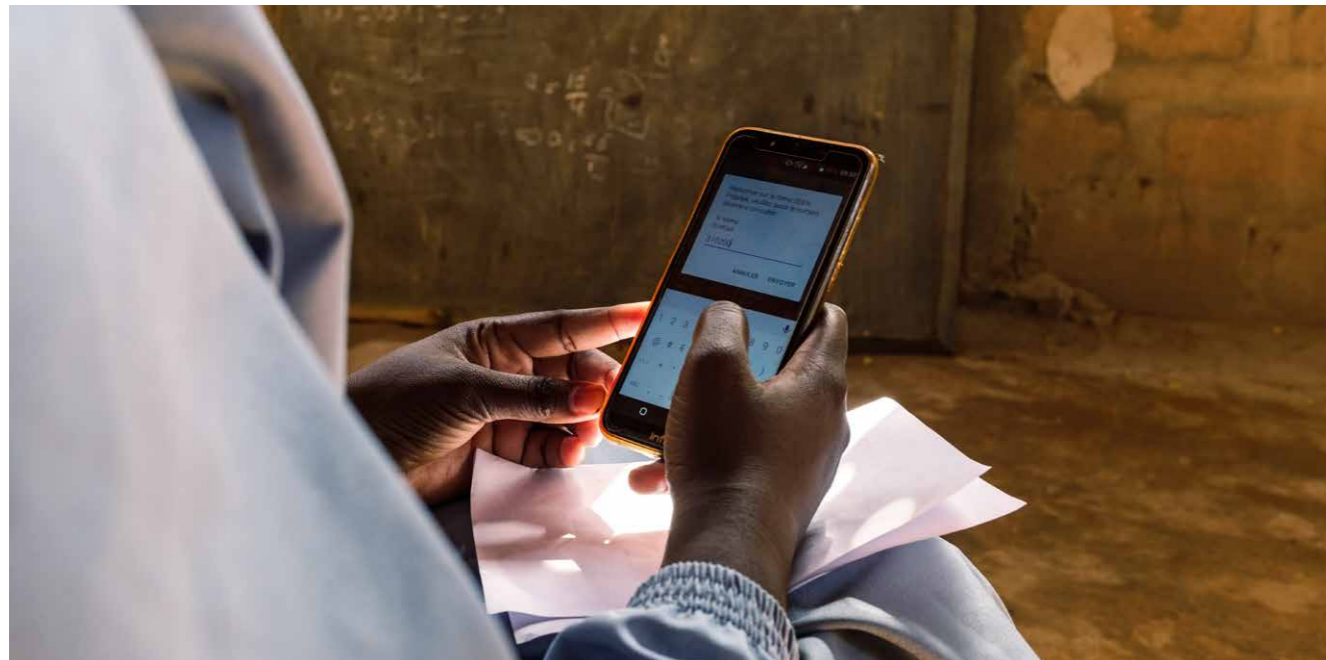
The United Nations Sustainable Development Goal (SDG) 6 is to 'Ensure availability and sustainable management of water and sanitation for all'.<sup>1</sup> While much progress has been made in increasing access to water, 2.1 billion people worldwide still lack access to safely managed water services.<sup>2</sup>

Since 2013, the GSMA Mobile for Development (M4D) Utilities programme has been working to unlock business models that leverage mobile technology to deliver better and more affordable energy, water and sanitation services in emerging markets. Through our Innovation Fund we have provided catalytic support to start-ups, non-governmental organisations, and utilities across Asia and Africa to trial and scale new models.

This support has helped validate and launch a variety of digital solutions to expand and improve water services.

Digitalisation is transforming how utilities function and how water services are delivered. New technologies not only enable existing systems to operate more efficiently, but also make new service delivery models possible. Some innovations are already available in the water sector, with some solutions scaling, while newer ones are developing. This report examines the experiences of two past Innovation Fund grantees, Wonderkid and CityTaps, whose journeys to scale hold lessons for all seeking to accelerate digitalisation.

Both companies are business-to-business (B2B) service providers. Wonderkid provides bespoke software solutions to 40 water utilities in Kenya and other African markets. CityTaps provides pay-as-you-go (PAYG) digital metering solutions to utilities. Currently operating in West Africa and Central America, CityTaps is looking to expand in the Kenyan market. Based on the experiences of these two grantees, we identify some critical considerations for innovators at different stages, from ideation to validation, iteration, refinement, scaling and widespread adoption. Their experiences also highlight some of the strategies and critical stages at which different actors can support innovators to scale, such as funders and the public sector.



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1. WHO and UNICEF (2017), *Progress on Drinking Water, Sanitation and Hygiene: Joint Monitoring Programme 2017 Update and SDG Baselines*.

2. "Safely managed water" refers to drinking water from an improved water source that is located on premises, available when needed and free from faecal and priority chemical contamination.



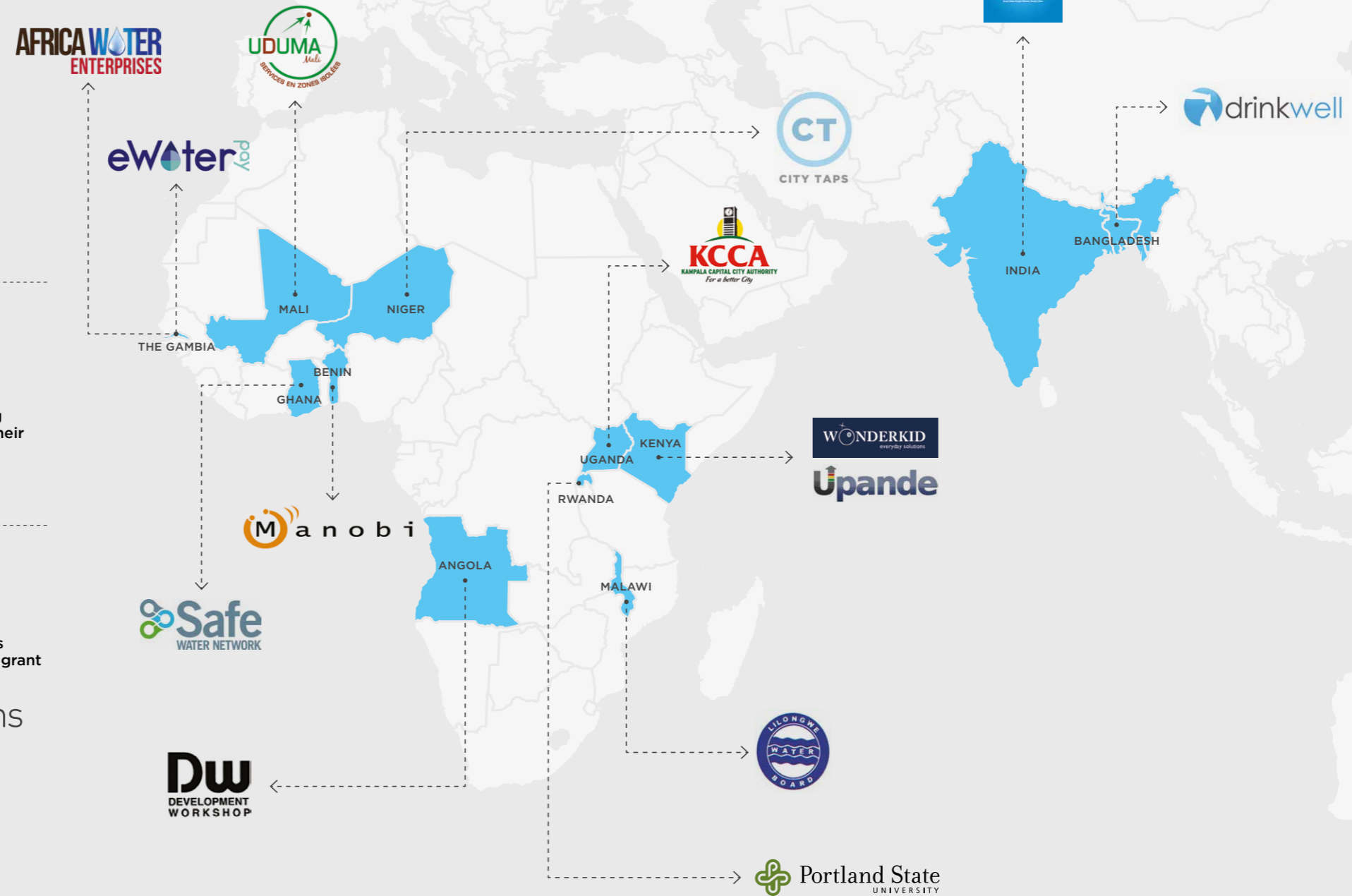


### GSMA M4D UTILITIES INNOVATION FUND WATER GRANTEES

Since 2013, the M4D Utilities has funded **14** water grantees in 12 countries across Africa and Asia (out of 50 grantees total)

Water grantees have raised an additional **\$6.6 million** after being awarded their Innovation Fund grant

Water grantees have had a direct impact on over **2.6 million** beneficiaries through the grant and another 945k by scaling the solutions





# 1 Introduction



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Digitalisation is set to transform water services. New technologies not only enable existing water systems to operate more efficiently, but they also make new service delivery models possible. Digitalising processes, such as meter reading, billing, payments and complaint management systems, has already led to better service delivery and optimisation by early-adopting utilities.

The potential benefits of digitalisation are clear, and many successful pilots have demonstrated the value of digital technologies. Yet, in many low- and middle-income countries, digitalisation remains at an early stage. Utilities are only just beginning to adopt digital tools and the innovation ecosystem is still developing.

Since 2013, the M4D Utilities programme has provided Innovation Fund grants to 14 organisations working in the water sector in 12 African and Asian countries. This report focuses on two innovative service providers' experience in scaling their solutions in Kenya.

Wonderkid provides bespoke software solutions to water utilities and other service providers. Its B2B model is well established in the Kenyan market, and in recent years it has expanded into other African countries. CityTaps provides digital metering solutions to utilities. After demonstrating its solution in Niger, it launched pilots in Burkina Faso, Senegal and Ecuador, and seeks to expand into Kenya. This report examines what has enabled these companies to scale in the Kenyan market, the barriers they have faced and the role of mobile tools in helping utilities reach performance targets set by the regulator.

## 1.1 DIGITAL SOLUTIONS IN THE WATER SECTOR

The United Nations Sustainable Development Goal (SDG) 6 is to “Ensure availability and sustainable management of water and sanitation for all”. While much progress has been made in increasing access to water, 2.1 billion people worldwide still lack access

to safely managed water. In Sub-Saharan Africa, just under 25 per cent of urban households have access to piped water.<sup>3</sup> Inequalities in service provision mean that many low-income communities rely on informal service providers and often pay more for water that is unsafe and less convenient.

While services need to be expanded quickly, many utilities are facing extreme financial pressures to simply keep services operating. Of the utilities reporting<sup>4</sup> to the World Bank's International Benchmarking Network for Water and Sanitation Utilities (IBNET) database, only 35 per cent are generating sufficient revenue to cover operation and maintenance (O&M) costs.<sup>5</sup> These financial pressures leave utilities little room to expand or improve infrastructure. Many utilities also struggle to collect customer payments effectively, and even where revenue collection rates are high, delays in collection can create pressure on utility cash flow.

The inability to invest in maintaining infrastructure can lead to a vicious cycle of service degradation. As services fail, customers become reluctant to pay for poor services, utilities lose even more revenue and staff morale declines.<sup>6</sup>

Water and sanitation services are among the most heavily subsidised in the world,<sup>7</sup> in part due to political pressure to provide water at low or no cost to end users. However, these subsidies have been shown to benefit wealthier households disproportionately. In a World Bank study of 10 countries, it was found that 56 per cent of subsidies reached the top wealth quintile, while only six per cent reached the poorest.<sup>8</sup>

These existing challenges are compounded by rapid urbanisation and climate change. Urban populations in African countries are expected to more than double by 2040.<sup>9</sup> Combined with the effects of climate change, many cities are now facing the very real possibility of running out of water. These twin trends mean that alongside rapid service expansion, utilities also need to focus on minimising non-revenue water (NRW) to maximise the use of available resources.

3. Hommann, K. and Lall, S.V. (2019), *Which Way to Livable and Productive Cities? A Roadmap for Sub-Saharan Africa*. World Bank.

4. 1,549 utilities in 147 countries

5. <https://www.ib-net.org/>

6. Soppe, G., Janson, N. and Plantini, S. (2018), *Water Utility Turnaround Framework: A Guide for Improving Performance*.

7. Andres, L. et al. (2019), *Doing More with Less: Smarter Subsidies for Water Supply and Sanitation*. World Bank.

8. Ibid.

9. GSMA Mobile for Development Utilities (2020), *Digital Solutions for the Urban Poor*.

## Non-revenue water explained

Non-revenue water (NRW) is water that is pumped from the environment, treated and distributed via the water network, but is never invoiced. Losses can be “technical” or “commercial” (also referred to as “real” and “apparent”).

Technical losses are caused by leaking and broken pipes that cause water to be “lost” before it reaches the customer. Commercial losses refer to water that is delivered, but for which revenue is not collected, for example, due to theft/ unauthorised consumption, or metering and billing inaccuracies.

The global volume of NRW has been estimated at 364 million cubic meters per day, equivalent to \$39 billion per year.<sup>10</sup> It is estimated that the revenue of the global NRW leak management solutions market will grow from \$850 million in 2018 to nearly \$1.6 billion by 2025.<sup>11</sup>

By failing to collect revenue for all the water they treat and distribute, utilities with high NRW rates cannot provide a sustained and reliable service, nor can they extend the network or make other investments, leading to a vicious cycle of service decline. Part of what makes NRW such a challenge is that the costs of gathering data on losses are high and mitigation measures are also expensive. Many utilities seek to calculate the Economical Level of Leakage (ELL) — the point at which the economic benefits of addressing NRW outweigh the costs. However, as concerns surrounding the overall availability of water grow, the motivation to address NRW changes from a cost-benefit calculation to one surrounding the absolute availability of the resource.

Digitalisation gives utility managers new tools to reduce NRW. Mobile-enabled monitoring is cheaper and more accurate, and helps to identify and manage technical and commercial losses. Digitalising payments makes revenue collection more efficient and, when combined with machine-to-machine (M2M) connectivity, can be linked directly to consumption with smart prepaid meters or water ATMs (i.e. digital water collection points), for example. At the same time, digitalisation can open the door for innovative models to reach unconnected and low-income households. Figure 1 outlines key emerging technologies and their uses. These technologies provide utility managers with some of the tools they need to break the vicious cycle of service decline.

These digital tools can benefit both utility providers and their customers, particularly low-income customers. Some of the benefit areas include:

- Greater financial sustainability for service providers:** Digital payment collection introduces efficiency and transparency since bills no longer need to be issued or collected manually. Combined with sensors or smart meters, billing can become fully automated. Switching to digital payments can also significantly reduce revenue losses from inaccurate billing. A GSMA and CGAP study of early-adopting providers found that digitalising payments reduced revenue collection costs by 57 to 95 per cent.<sup>12</sup>
- Expanded services to low-income customers:** Digital payments through mobile money combined with smart metering make it possible to offer more affordable payment plans. Together they can support pre-paid household connections, or water ATMs, eliminating delayed billing for providers and large, unpredictable bills for customers. Low-income households can plan more easily for small and regular payments, and it is viable for utilities to serve them since payment is collected upfront. Utilities are also able to extend formal services to new customers who would otherwise pay more for water from informal vendors, saving customers money and adding revenue for the utility.

10. Liemberger, R. and Wyatt, A. (2019), “Quantifying the global non-revenue water problem”, *Water Supply*, 19(3), 831–837.







11. Frost & Sullivan (October 2018), “Growth Opportunities in Global Smart Water Leakage Management Solutions Market, Forecast to 2025”, *Research and Markets*.

12. Waldron, D. et al. (2019), *Testing the Waters: Digital Payments for Water and Sanitation*. CGAP.

- Greater operational efficiency and reduced losses:** Digitally tracking utility functions gives managers better oversight of operations and necessary interventions. Historically, the costs associated with monitoring systems have been high, but new technologies allow for remote monitoring of leaks, water levels and energy consumption. These all allow utility managers more complete oversight of operations. Digitalising payments can also fast-track the creation of a reliable customer database, which many utilities lack.
- Improved customer relations and services:** Digital tools create a communication bridge between a utility and its customers, giving customers the ability to log complaints remotely and have them resolved faster. Effective communication and resolution are the foundation of the “social contract” between providers and customers, and supports a virtuous circle of service improvement, customer trust and greater willingness to pay. This communication channel also enables utilities to notify clients in case of leakages, abnormal water consumption and low balance, thus helping users to better manage their water use.

FIGURE 1

## Digital solutions in urban water

SOLUTIONS	USE CASES
Voice, SMS and USSD functions	 <p>Mobile services create a communication bridge between utilities and customers that makes it easier to register and resolve complaints. These tools enable utilities to inform customers of maintenance work or issue disconnection notices, allowing customers to pay promptly and avoid disconnection.</p>
Pay-as-you-go (PAYG)	 <p>Mobile-enabled PAYG services allow customers to make micropayments in advance for water services, and guarantee revenue collection for water service providers. Applications include business models for energy, water, sanitation and clean cooking appliances.</p>
Smart metering	 <p>Automatic meter reading is essential for gaining efficiencies in billing as it records consumption and key operational data, and eliminates the time, costs, and errors of manual meter reading. Other uses are post-paid models or water ATMs.</p>
IoT/ M2M connectivity and GIS tracking	 <p>Smart monitoring of system performance can improve operational efficiency and avoid the technical losses that contribute to NRW. This is essential in the deployment of real-time data systems, for example, in leak detection, inaccurate meters and fraud.</p>
Big data, AI and machine learning	 <p>The use of large data sets to improve decision making and implement algorithmic automation to optimise utility operations. For example, programming pumping to take place when grid energy prices are low.</p>
Augmented reality and virtual reality tools	 <p>Combined with remote sensing, these tools create ‘digital twins’ that eliminate the need to travel to a site to identify and resolve issues, and allow remote management of network infrastructure in real time.</p>

### 1.1.1 Scaling digital innovations for water services

Scaling a service can mean many things, but essentially it involves increasing the number of people using a service. Scale can also mean different things to different actors:



For utilities, scale in digitalisation is heavily linked to the degree to which digital tools and processes are integrated across all business areas.



For innovators, scale is linked to the development and growth of their business. Scale implies that the business has moved towards becoming financially sustainable.



From the perspective of a community, scale may be experienced by the degree to which services become part of everyday life and the life of their community.



For a technology, scale is related to the degree of acceptance and replication across different utilities, companies and contexts.

In a white paper,<sup>13</sup> the International Water Association (IWA) Digital Water Group set out the phases of adoption for a utility seeking to digitalise services. The IWA’s “digital adoption curve” maps the steps a utility can take to introduce more sophisticated technologies and increasingly digitalise operations (Figure 2). In many low-income countries, utilities are in the early stages of digital adoption.

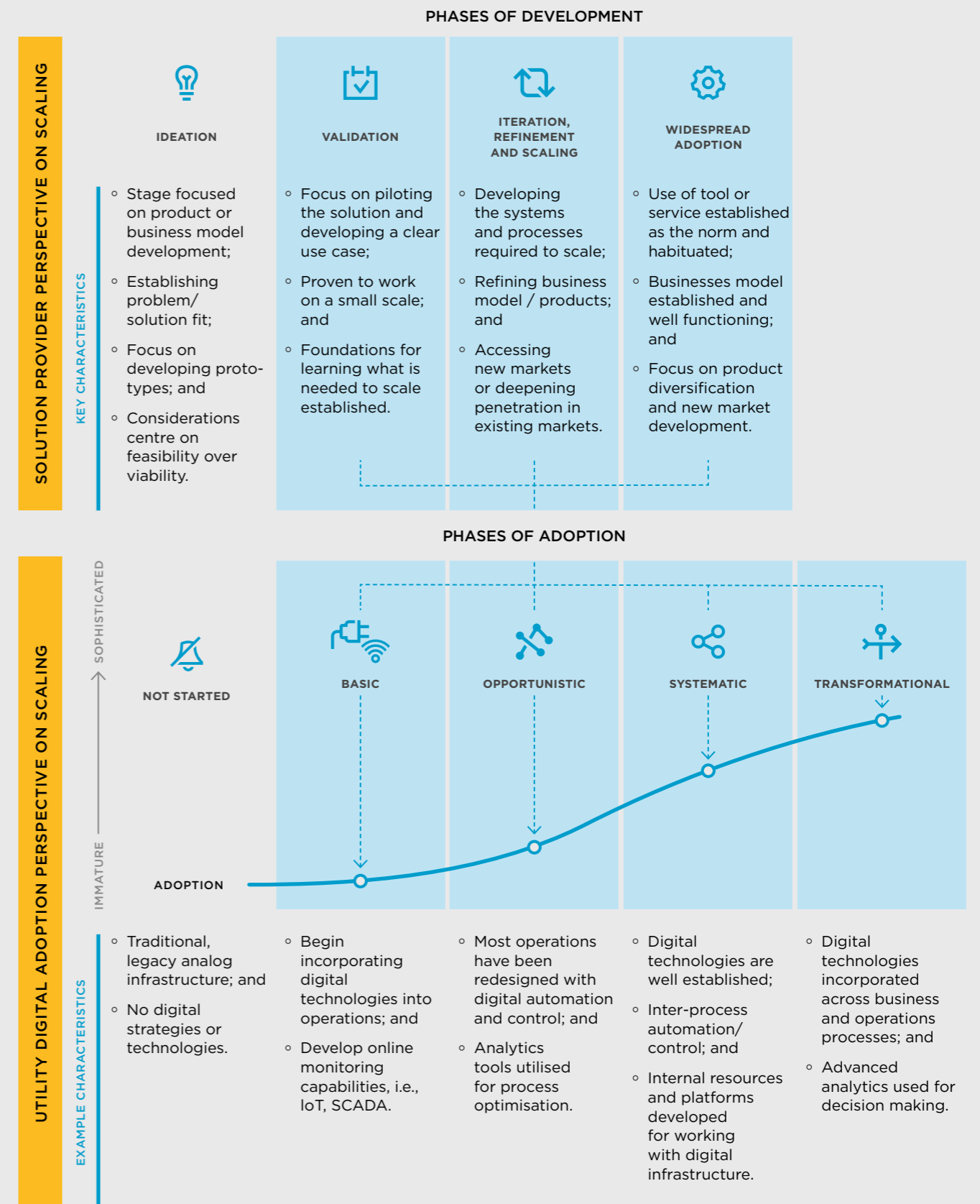
The journey of a utility provider in scaling digital technology is fundamentally different to that of a digital solution provider. These providers experience scaling through the growth and development of their business and the evolution of the products and services they offer. Digital solutions providers will be partners to utilities throughout their digitalisation journey, providing different products and services that are relevant at different stages.

For digital solutions providers, there are many potential strategies for scaling. Through our funding to early-stage start-ups, the GSMA has identified four commonly used scaling models or strategies. These are not mutually exclusive and can be used in combination.

- **Organic growth or ‘bootstrapping’** enables an innovator to grow their business while retaining control and ownership of operations. While there are benefits related to company control, this can be a very slow growth strategy if there are not also injections of capital (either debt or equity) at critical points.
- **Multi-stakeholder partnerships** can provide a platform for scaling and includes public-private partnerships where the capital for investment can come from either party.
- **Licensing products** is somewhat dependent on the product and its suitability to being licensed. Licensing and franchising enable faster replication of the models while ensuring financial return to the innovator.
- **Acquisition** typically brings larger investment by an established company with the organisational apparatus to support scale. Acquisitions also create the opportunity for early-stage investors to exit, which can strengthen start-up ecosystems by recycling capital and attracting other investors.

FIGURE 2

### Innovator and utility journeys in scaling digital solutions



Source: Utility digital adoption curve adapted from IWA 2019; solution provider journey developed by authors.

13. The International Water Association (2019), *Digital Water: Industry Leaders Chart the Transformation Journey*.



For both Wonderkid and CityTaps, a combination of bootstrapping and growth through multi-stakeholder partnerships have defined their scaling strategies to date.

## 1.2 FOCUS OF THE RESEARCH

### 1.2.1 Approach

The findings in this report are based on several research studies by the GSMA. To understand the impact of Wonderkid's tools on utilities and end users, and fully grasp how a start-up like Wonderkid could scale so rapidly from serving five utilities at the time of the grant (2015) to 40 utilities in 2020, the GSMA hired an external consultant to conduct field research. This research included in-depth case studies of three water utilities Wonderkid works with, and a survey of 430 water customers. Data from the Kenyan regulator (WASREB) impact report and Wonderkid's backend system was also analysed to quantify the impact of Wonderkid's tools on the utilities.

In 2020, the GSMA also hired an external consultant to conduct a market study on how CityTaps' success in Western Africa could be replicated in the Kenyan market. The objective was to understand both the enabling and inhibiting factors affecting PAYG water services in Kenya. This research included a market assessment using secondary data and a series of interviews with the Ministry of Water, the regulator, water companies, banks and investors working in Kenya, development finance institutions (DFIs) and private sector actors deploying smart meter solutions. Insights from this research were supplemented by lessons from CityTaps' and Wonderkid's Innovation Fund grants and grant evaluations.

### 1.2.2 The Kenyan water sector

This section provides a brief overview of the Kenyan water sector. The latest estimates<sup>14</sup> from the WHO and

UNICEF Joint Monitoring Programme are that only 59 per cent of the Kenyan population has access to a basic water service.<sup>15</sup> Among those in the poorest quintile (bottom 20 per cent), 63 per cent do not have access to at least basic water service, compared to eight per cent of the richest quintile (which represent the top 20 per cent). In Kenya, access to safely managed urban water services fell from 62 per cent to 50 per cent between 2017 and 2020, but these high numbers obscure the low quality of the service since water is not piped to households. Solutions must therefore not only increase access, but also improve access.

Since the early 2000s, reforms have focused on commercialising water service delivery in Kenya. The Water Act 2002 created the national regulator, the Water Services Regulatory Board (WASREB) and the framework for licensing water service providers (WSPs). WASREB is responsible for regulating tariffs and the performance of the WSPs, and has the power to withdraw licences in cases of consistently poor performance. WSPs can be public or private entities, but the vast majority are state-owned. In 2010, Kenya adopted a new constitution that devolved responsibility for water services to the newly formed county governments. In 2016, a new Water Act was passed harmonising the provision between the 2002 act and the 2010 constitution.

The [Kenya Vision 2030](#) national development plan seeks to make basic water services available to all Kenyans by 2030. However, the annual cost of investment and rehabilitation required is estimated at \$303 million.<sup>16</sup> With a budget allocation of less than \$200 million in recent years, there is a considerable financing gap. As a result, WSPs need to operate more efficiently and recover as many costs as possible.

Kenya is particularly well suited to digitalisation due to regulatory oversight of WSP service delivery, financing gaps and an advanced mobile phone infrastructure and digital ecosystem. Vis-a-vis other African countries, Kenya has high mobile phone coverage and widespread adoption of mobile payment systems, enabling both innovators and providers to seize the opportunities offered by mobile-enabled solutions.

# 2 Journeys to scale



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14. Latest estimates are for access to services in 2017. See: <https://washdata.org/data>

15. Drinking water from an improved source, provided collection time is not more than 30 minutes for a roundtrip, including queuing.

16. World Bank (2016) - *Scaling Up Blended Financing of Water and Sanitation Investments in Kenya*





## 2.1 WONDERKID

Founded in 2007, Wonderkid is a software development company from Kenya that began working in the water sector in 2012. The GSMA M4D Utilities Innovation Fund awarded Wonderkid a grant in May 2015 to deploy its solution with four water utilities in Kenya.

Wonderkid supports utilities in several areas: digital payments, billing efficiency and revenue collection, operational oversight, and customer service and information. Figure 3 demonstrates the value of these tools for both utilities and their customers.

Wonderkid's solution is a suite of 13 customer- and utility-facing tools, including: MajiVoice,<sup>17</sup> a mobile app for meter

readers to record meter readings digitally, and a self-meter reading and payment system for users to send their own meter reading via SMS and pay via mobile money. Wonderkid also provide technical support for utilities to integrate mobile payments in their billing systems.

Since Wonderkid's tools are modular, utilities can opt to purchase one or more tools, allowing smaller utilities to adopt them incrementally. To make the technology affordable for water utilities, Wonderkid charges a small monthly fee rather than a large upfront

fee. In 2020, Wonderkid is releasing three product lines to shorten the sales cycle and enable utilities to purchase Wonderkid's software quickly. Through a self-serve portal, utilities can sign up for the product they want and select the service or tools they require. Implementation is completed remotely, and utilities are supported through online training and a resource library. This new model will enable the products to scale across markets. The timeline in Figure 4 illustrates Wonderkid's journey from serving five utilities in Kenya at the time of the grant to 40 utilities in five countries.

17. <http://www.majivoice.com/>

FIGURE 3

### Wonderkid's tools and their benefits to water utilities

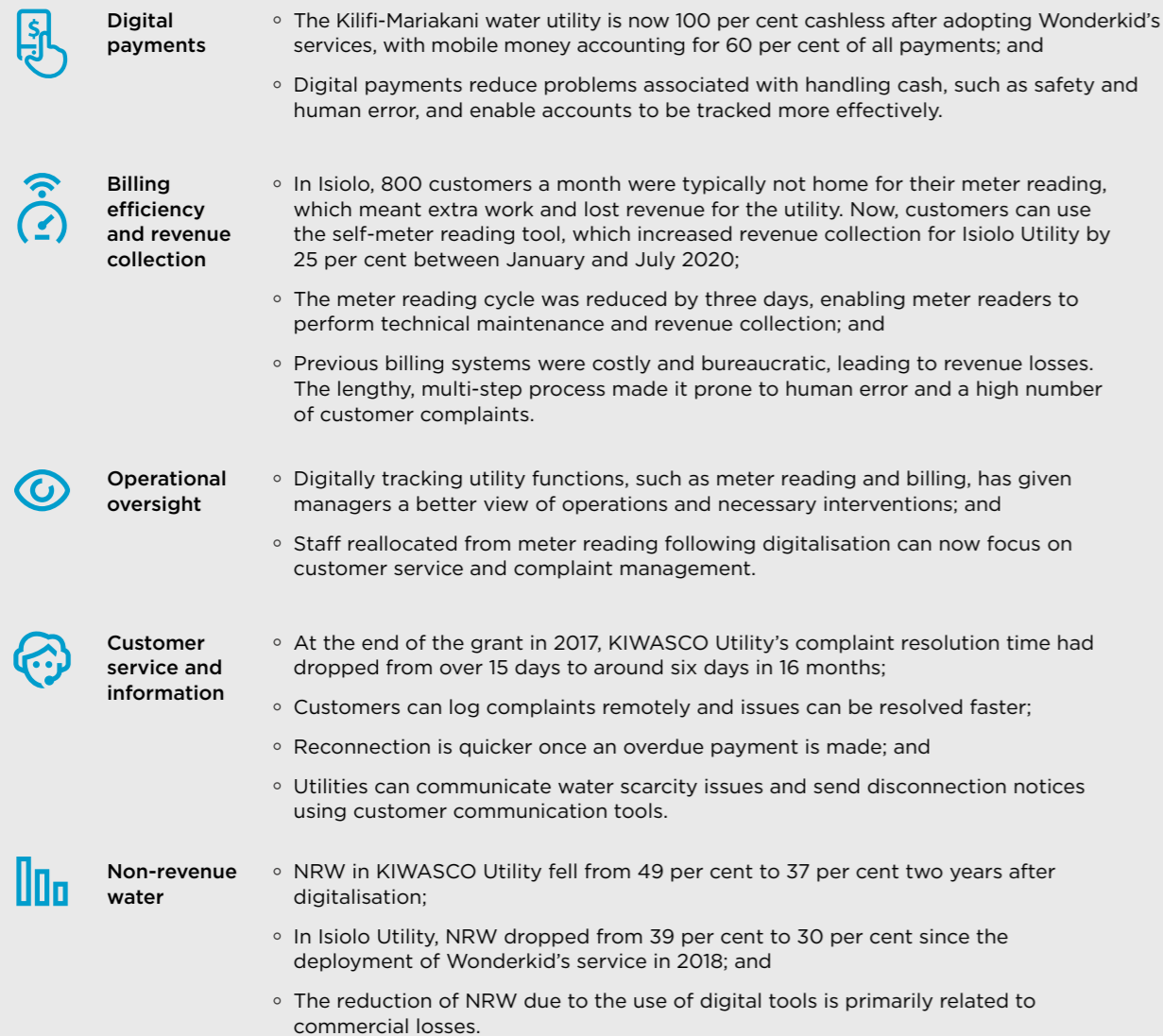
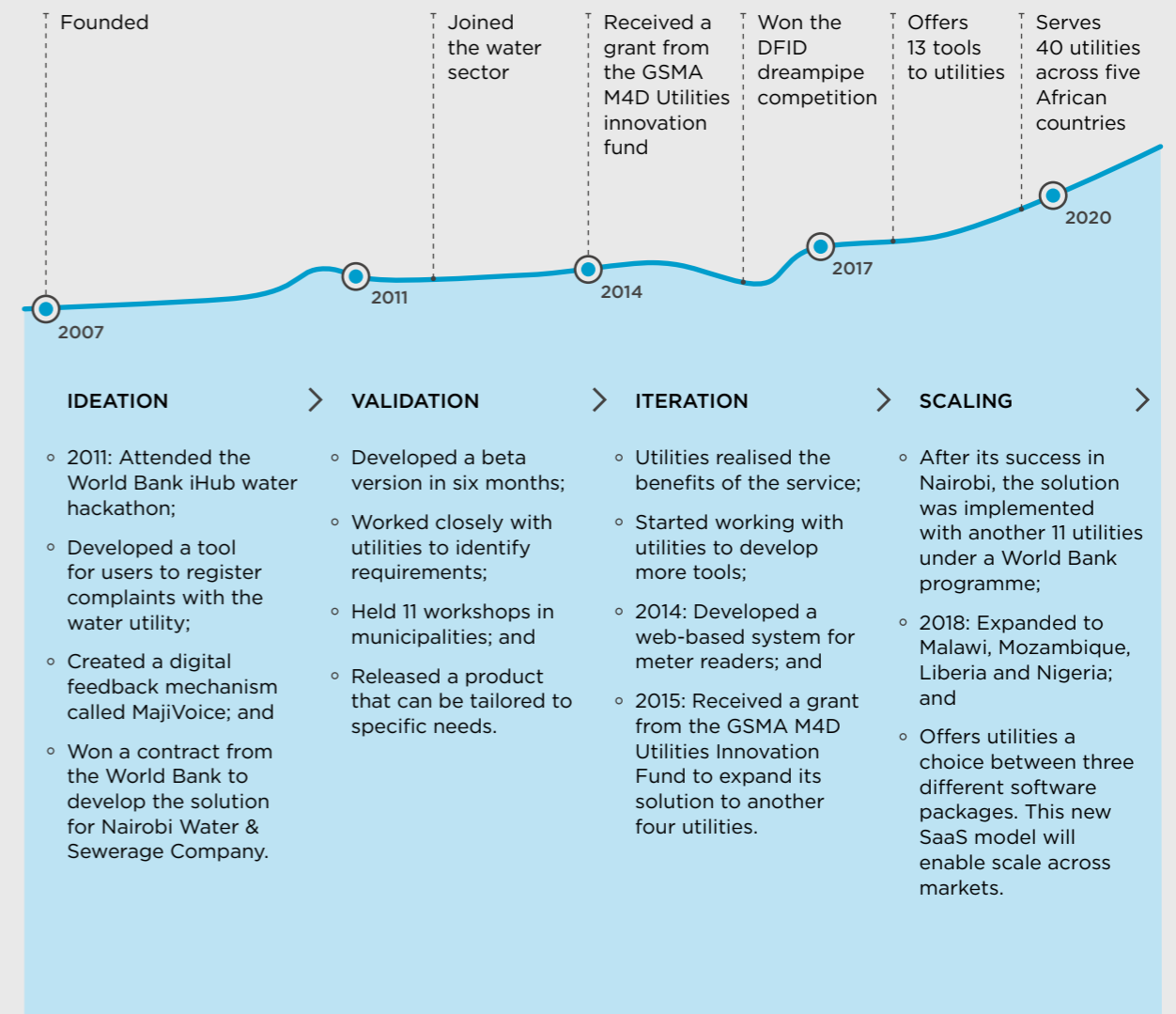


FIGURE 4

### Wonderkid's journey to scale





## 2.2 CITYTAPS

CityTaps has developed a water utility subscriber management solution, CTSuite, which combines a smart, prepaid water meter (CTMeter) with an integrated software management system (CTCloud) to process PAYG payments through mobile money.

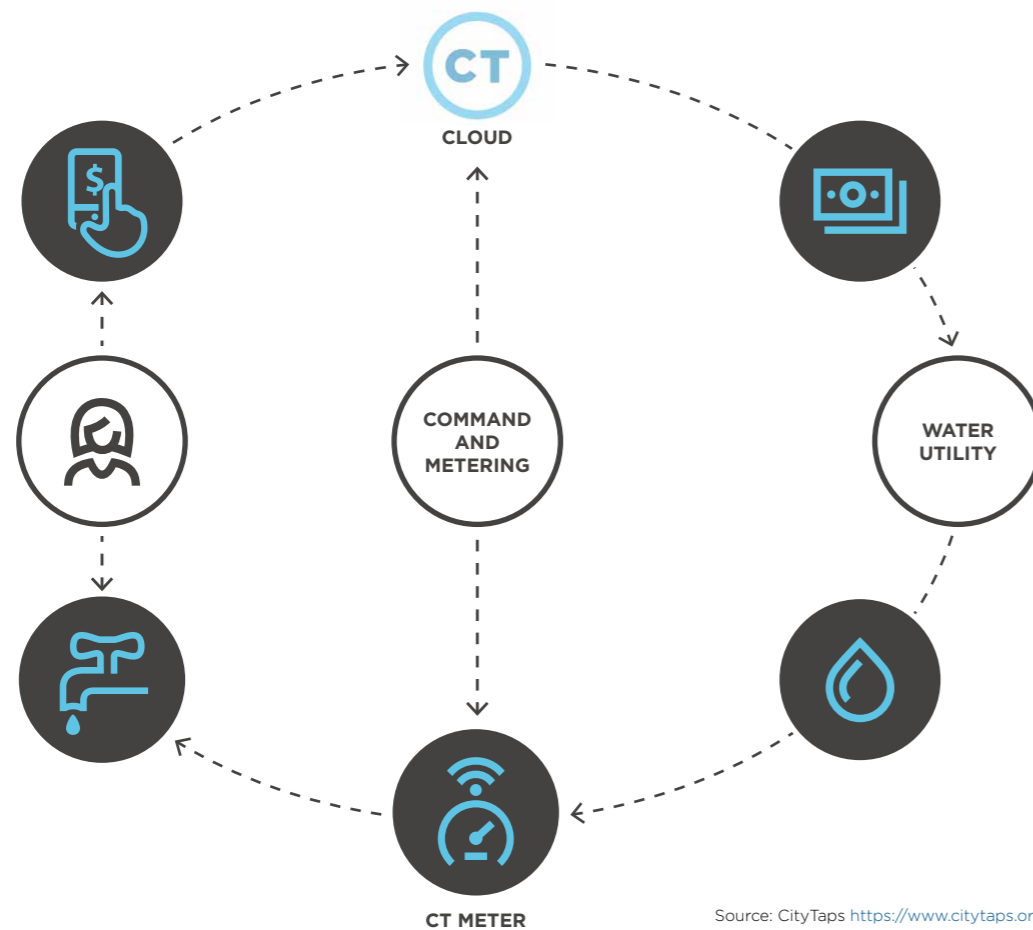
With CTSuite, low-income urban residents can have running water at home and use mobile money to credit their water balance, which automatically opens access to the PAYG meter via LoRaWAN<sup>18</sup> connectivity. The prepaid water meter communicates with the CTCloud software in real time, enabling water utilities to improve their cash flow and balance sheets and to monitor meters remotely.

Early on, pressure to be commercially sustainable kept Kenyan utilities from expanding water coverage to the urban poor. For this customer segment, the risk for accounts receivable is high, as about 20 per cent

of subscribers are regularly disconnected because of accrued arrears. However, CityTaps' solution helps utilities collect revenue and recover arrears, putting utilities in a financial position to reconnect former subscribers and expand coverage to new low-income subscribers.

In September 2015, the GSMA M4D Utilities Innovation Fund awarded CityTaps a grant to launch smart prepaid water meters in Niamey, Niger, in partnership with the local water utility, Société d'Exploitation des Eaux du Niger (SEEN) and Orange Niger. In April 2018, CityTaps received another GSMA grant to continue scaling this service and deploy 1,325 smart meters. In November 2019, CityTaps successfully completed the GSMA grant, installing 1,325 smart meters and reaching over 10,500 people.




Figure 5 illustrates how the CityTaps solution has benefitted Niger's water utility, SEEN, its customers and Orange Niger, the mobile operator.



Source: CityTaps <https://www.citytaps.org/>

FIGURE 5

### Benefits to utilities and consumers

- 
**Savings for consumers**
  - PAYG makes it affordable for the urban poor to access water as it enables low-income consumers to pay for water incrementally, giving them more control over their budget;
  - New subscribers save up to 94 per cent per cubic meter of water consumed because the regulated SEEN water price is up to 16 times cheaper than water from pushcart vendors;
  - Customers used to wait an average of nearly 1.5 hours a day to obtain water from alternative delivery services (pushcart vendors), but can now top up their water credit in just seven minutes on average, gaining 86 minutes every day; and
  - Before subscribing to CityTaps, 84 per cent of customers perceived their water consumption management as “not good” or “not good at all”, but approximately 82 per cent now perceive it as “good” or “excellent”.
  
- 
**Improved revenue collection**
  - Since the water service is paid in advance, SEEN's revenue collection exceeds 100 per cent for the part of the network on which the CityTaps solution has been deployed;
  - During the grant, SEEN was paid 18 days in advance on average which was a huge improvement from previous operations;
  - PAYG saves time and money by calculating customer usage and bills instead of staff collecting meter readings; and
  - SEEN implemented customised debt collection schemes for subscribers and recovered arrears through affordable daily micropayments.
  
- 
**Mobile money**
  - Approximately 96 per cent of customers who used mobile money before subscribing to CityTaps say they have increased their mobile money usage as a result of the CityTaps solution; and
  - 16 per cent of subscribers became new mobile money customers to use the PAYG meters.

### What is Pay-as-you-go?

Pay-as-you-go (PAYG) refers to pre-paying for a service in a flexible manner. There is no fixed pre-paid amount, and payment is due before a service or product is delivered. PAYG models can address commercial losses as customers pay in advance for the water they plan to consume. Also, by reducing non-payment risks, PAYG encourages utilities to expand coverage and connect customers regardless of their perceived creditworthiness.

PAYG solutions play a critical role in achieving SDG 6 by:

- Guaranteeing immediate and transparent cash collection that reduces default and delayed receivables;
- Reducing water consumption;
- Reducing financial risk for water utilities and financial partners;
- Allowing customers to save time and money, and avoid the health risks of water from unsafe alternative sources; and
- Enabling water utilities to use existing cash flow to invest in extending water networks and production capacity.

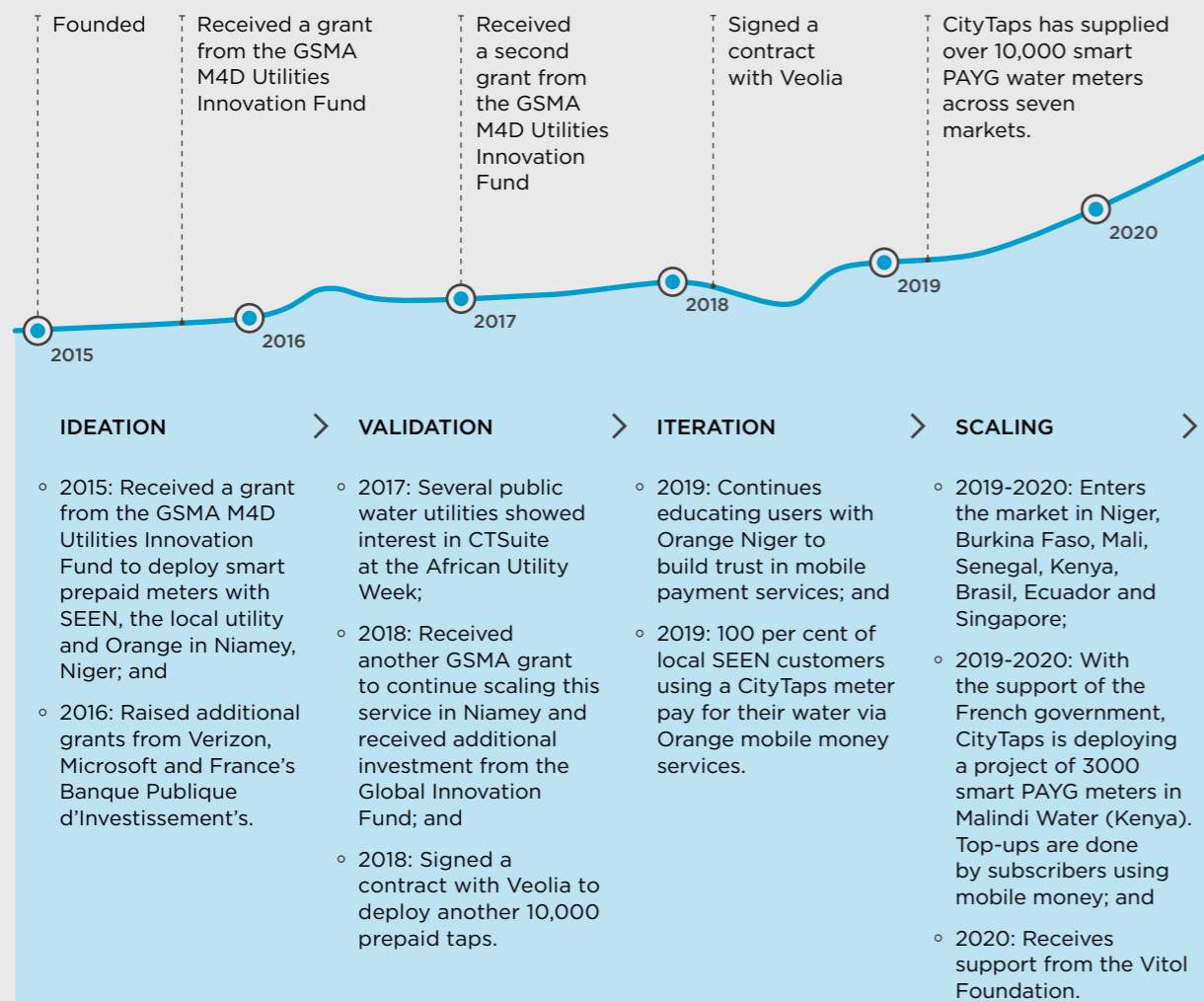
18. LoRaWAN (long range) is a spread spectrum modulation technique derived from chirp spread spectrum (CSS) technology.



CityTaps' growth model depends on individual meters being installed at households, rather than a service or software being made widely available to all at once. The

timeline in Figure 6 illustrates CityTaps' journey to scale in which it has supplied over 10,000 smart PAYG water meters across seven markets.

FIGURE 6  
CityTaps' journey to scale



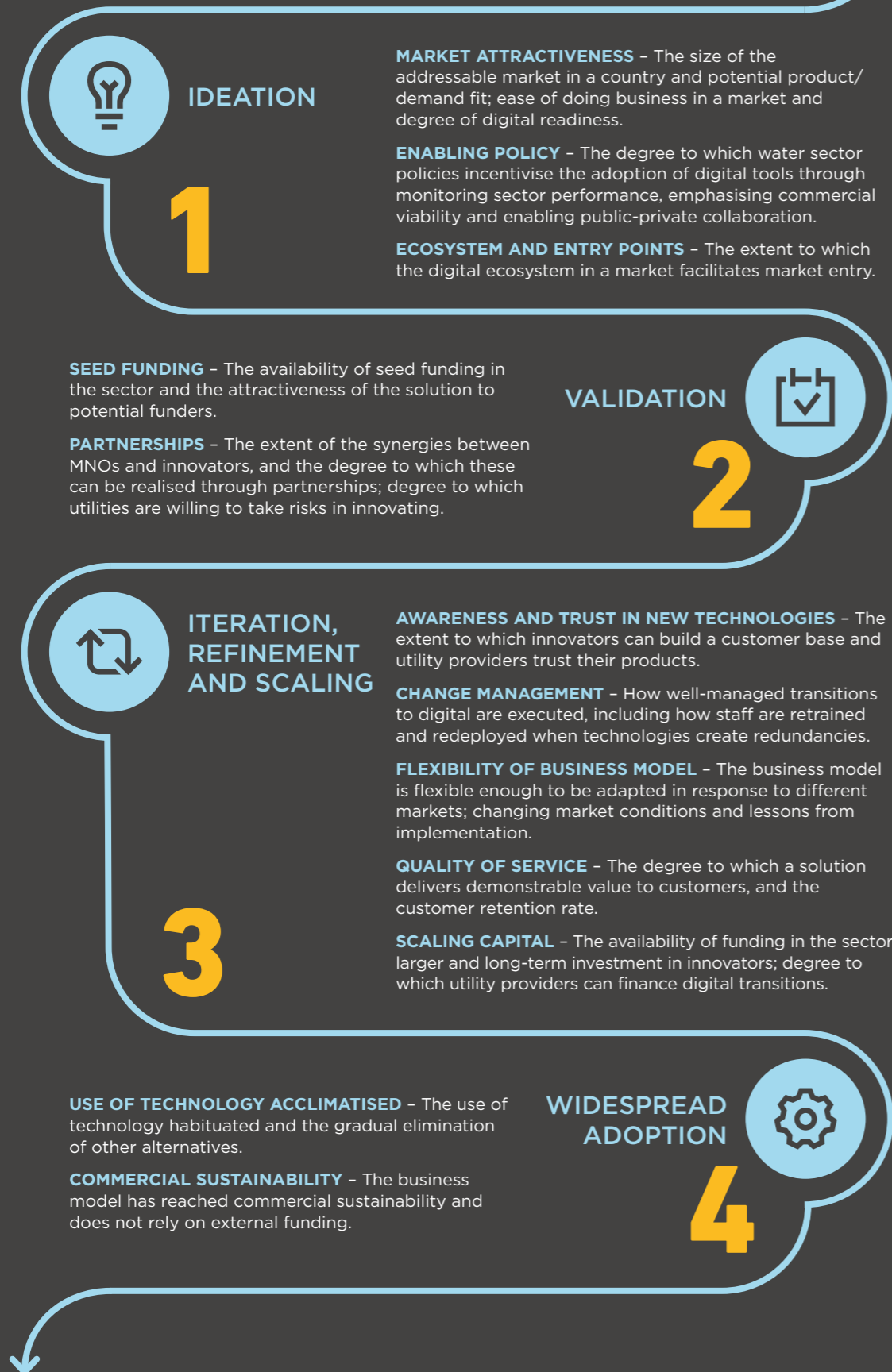
# 3 Enablers and barriers to scale



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## CRITICAL FACTORS IN CITYTAPS' AND WONDERKID'S JOURNEYS TO SCALE



## 3.1 IDEATION

The ideation phase is the initial phase of development and centres on developing an idea, prototype or outline of a business model. At this stage, it is important to have the problem clearly defined, and for the solution provider to identify where there will be strong demand for the product or service. It is essential that innovators, service providers and funders have opportunities to meet to develop these ideas. Questions for a solution at this stage often focus more on feasibility (“Can it be done?”) than viability (“Is it worth doing?”), which is addressed in more detail at later stages of development.

### Market attractiveness

For digital solutions in emerging markets, digital readiness is key for service adoption. In Kenya, the market is extremely well equipped with 52 per cent penetration of unique mobile subscriptions, compared to 45 per cent unique mobile penetration across Sub-Saharan Africa (Figure 7).<sup>19</sup> With 59 per cent of the population still lacking access to at least basic water services in Kenya,<sup>20</sup> there is a clear addressable market for digital solutions in the water sector.

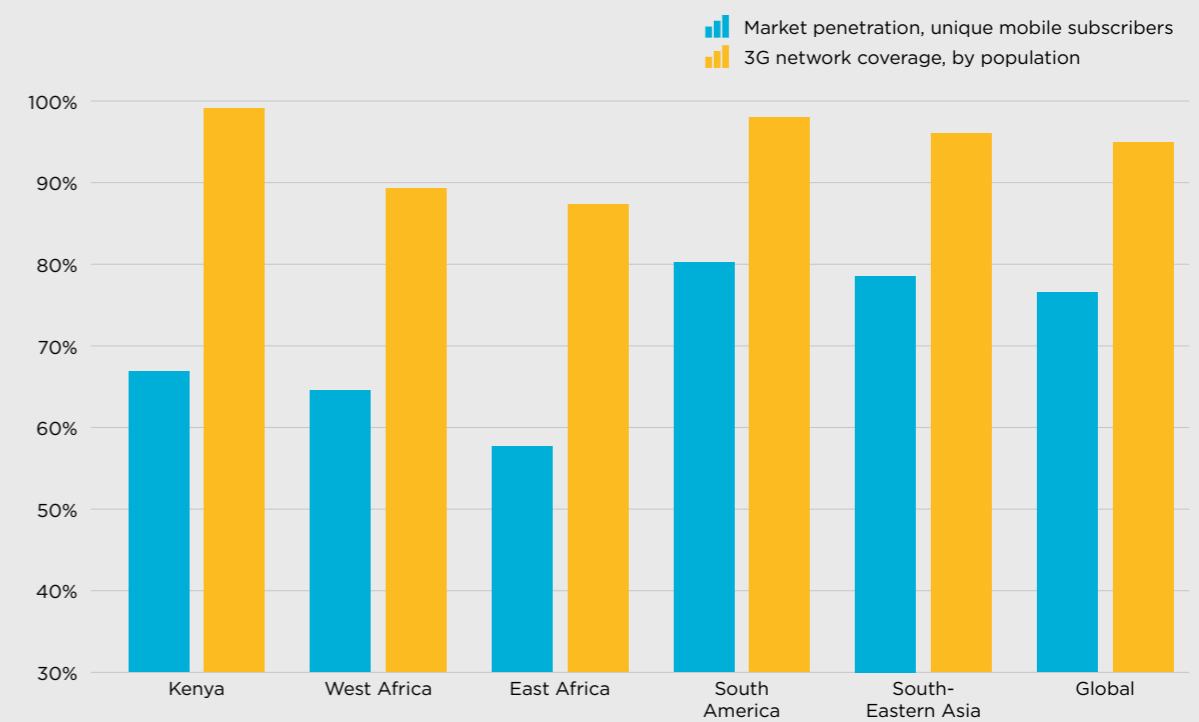
Mobile money adoption rates vary across markets. Adoption levels let innovators know how much work is needed to increase service adoption. A low mobile money adoption rate can also mean that Mobile Network Operators (MNOs) are more willing to partner with innovators to drive adoption. This market characteristic is increasingly important at the validation stage when innovators must drive adoption of the solution.

19. GSMA Intelligence - <https://www.gsmainelligence.com/>

20. WHO and UNICEF (2017), *Progress on Drinking Water, Sanitation and Hygiene: Joint Monitoring Programme 2017 Update and SDG Baselines*.

FIGURE 7

### Mobile coverage and penetration in Kenya and other regions



Source: GSMA Intelligence



For innovators, the digital water sector in emerging markets is increasingly competitive, which can be both positive or negative in terms of market attractiveness. The presence of some companies in the sector indicates the space is viable, while the absence of companies is a sign of institutional or market barriers that have yet to be overcome. Similarly, if the market is saturated with innovators seeking to enter the market, they will need to have a clear advantage over competing solutions.

CityTaps is currently planning to enter the Kenyan market. Our research identified nine other companies in Kenya with a somewhat similar market offering,<sup>21</sup> including some international firms with multibillion dollar annual revenues. Despite this competition, no utility has yet implemented PAYG smart meters. To be successful in Kenya, CityTaps will need to articulate their unique value in the market or outmanoeuvre the competition in marketing and sales.

### Enabling policy

Enabling policy is another critical factor for innovators. In the water sector, policies that incentivise performance improvements can create demand for digital solutions. In Kenya, the regulator takes an active role in managing performance, which can create demand for tools that support improvement. Wonderkid's tools enable utilities to meet KPIs set by the regulator. But relying too heavily on policy requirements, which are always evolving, can be a risky business strategy and limit the scalability of a solution to other markets. Policy can also constrain a PAYG solution in markets where prepaid water systems or disconnecting customers are not allowed. For mobile-enabled digital solutions, mobile money regulations are notable potential barriers. [The GSMA Mobile Money Regulatory Index](#) can be a valuable resource for understanding this landscape.

### Ecosystem and entry points

A vital part of the ideation stage is having opportunities to forge connections that allow an idea, product or service to develop. Innovators will thrive in markets where the ecosystem enables and encourages partnerships (especially public-private partnerships)

and there are strong forums for stakeholders to collaborate. Wonderkid's entrance to the water sector was, in part, facilitated by the iHub Water Hackathon in 2011, highlighting the importance of such events in bringing providers into the sector. From that initial engagement, Wonderkid has fostered a close relationship with WASREB and other key stakeholders.

Kenya has long been recognised as a hub for digital innovation on the African continent, and with that has come a great deal of external investment. In Kenya, about 37 per cent of co-founders are expatriates,<sup>22</sup> and foreign-owned companies tend to receive more funding than their counterparts (88 per cent of venture capital in the market). To tackle this, in 2020 the Kenyan Government updated its ICT policy to require that foreign-owned ICT companies have at least 30 per cent Kenyan ownership to continue operating in the country. Wonderkid has demonstrated that a team with strong local and contextual knowledge of the market can be beneficial when addressing barriers to scale. As Wonderkid and CityTaps have expanded internationally, both employ locals to work with utilities to deploy technical solutions that require on-the-ground support.

## 3.2 VALIDATION

When preparing to scale a solution, innovators must validate their product or service through a strong use case or successful pilot. At this stage it is critical to draw on the lessons from the initial application and use them to refine the offering. Both Wonderkid and CityTaps have had to substantiate the successful results of their tools at a small scale before expanding their service offering and client base.

As part of its validation process, Wonderkid worked closely with customer teams and held workshops in 11 municipalities where Nairobi Water operated. It quickly realised that tailored solutions would need to be developed for each municipality, giving rise to two critical elements of its business model: i) offering a range of digital tools for utilities to choose from, and ii) implementing its solution on the ground, securing additional capacity as needed.

### Seed funding

It is at the validation stage that innovators often need an injection of capital, either grant funding or flexible capital. For established companies, financing can be channelled from other, profitable sides of the business. Start-ups, however, are likely to need external investment, such as early equity investment or bootstrapping. For Wonderkid and CityTaps, a combination of grant funding<sup>23</sup> and competitive tenders<sup>24</sup> provided the capital for validation.

### Partnerships

At this stage, innovators providing utility solutions need to cement partnerships with utilities. Wonderkid is actively involved in the ecosystem to attract new utility clients and form partnerships. Many of its clients have come via word of mouth from utilities that are happy with the quality of its service. Others have come from answering RFPs and outreach at key industry events. CityTaps has worked to get buy-in from key industry players, such as Veolia, and given presentations to utility members of the African Water Association through its Scientific Technical Council Session.

For mobile-enabled solutions, partnerships with MNOs are key to delivering a solution and growing a company. CityTaps' partnership with Orange has proved to be a win-win. CityTaps can take advantage of Orange's brand recognition and mobile money platform, while Orange benefits from a positive use case for mobile money among its urban market segment. After a successful partnership between CityTaps and Orange in Niger, where CityTaps' customers significantly increased their usage of Orange Niger's service, Orange Burkina Faso invested in CityTaps' prepaid smart meters in Ouagadougou to help CityTaps offer the solution on a lease basis to the utility. CityTaps provides the solution at a lower risk and Orange collects the revenue from the utility via mobile money. Orange has also supported CityTaps in the deployment of LoRaWAN.

Wonderkid's partnership with Safaricom has focused on supporting utilities to adopt mobile money payments and integrating the payment platform with their

enterprise systems. This provides a seamless experience for customers, who receive accurate bills and make payments from their mobile phone. Safaricom also supports utilities with marketing material to promote mobile money payments.

In validating its model, CityTaps quickly realised that the lowest transaction fee charged by its mobile operator partner, Orange Niger — \$0.20 for payments between \$2 and \$4 — was too high for its low-income customer base. To address this, [CityTaps proposed that Orange introduce a new water-specific tariff](#) for transactions between \$0.84 and \$1.68, with a significantly lower transaction charge of \$0.08. Low-income customers are now able to make smaller and more frequent payments without a disproportionately high transaction fee.

Effective partnerships between innovators and mobile operators or utilities are not easy to develop given their very different priorities, size, regulatory boundaries and overall way of working. In forging partnerships, parties on both sides need to recognise the other's constraints and develop a plan that considers these frictions. Given the challenges, it is essential that the partnership delivers demonstrable value for both sides.

## 3.3 ITERATION, REFINEMENT AND SCALING

Scaling is not a linear process. It requires constant iteration and a flexible business model that can be adapted to changing environments. Operational changes are also often required in preparation for scale. While some companies might make it a strategic priority to pursue greater adoption in an initial market or enter new markets, ambitious start-ups may pursue both simultaneously, especially since working with government utilities is a slow process. By expanding to new markets, innovators may achieve economies of scale in production and spread out risk across different markets. However, new markets can introduce new operating challenges. Companies that rely too heavily

21. Smart meters with an integrated data platform.

22. Timon Capital and Briter Bridges (2019), *2019: Salaries and Compensation Across African Startups*.

23. From the GSMA and others.

24. Wonderkid won a World Bank tender to develop a solution for Nairobi Water, and CityTaps a contract with Veolia to supply smart meters.



on certain market characteristics (e.g. mobile phone adoption) will fail to penetrate new markets unless they adapt their business model. This is evident where innovators have failed to educate users and help them become accustomed to using the tools.

### Awareness and trust in new technologies

Building trust is critical for any innovator seeking to scale a solution. Given that their technology, approach or business model will be new to many stakeholders, some might be (rightly) sceptical about the value it will deliver.

Utilities are often bound by procurement processes that require solutions to clearly demonstrate value for money. This can be a challenge with emerging technologies since solutions are not always proven at scale, the benefits can be uncertain and there are often complex integration and management issues. There is also information asymmetry between the solution provider and utility, with the provider often knowing far more about the technical nuance of the solution. Many utilities have “had their fingers burnt” with new technology, whether through hardware failing or not living up to performance promises, or by finding themselves “locked into” contracts with providers where there were hidden costs (for example, ongoing hosting or software support). Given that utilities have limited financial resources, or lack the technical know-how to assess the different implications of digitalisation, many remain risk-averse when it comes to procurement.

To address these challenges, B2B innovators working with utilities need to invest in developing a very clear value proposition that recognises procurement constraints. Trust in new technologies can also be developed by investing in the capacity of utilities to assess new technologies in competitive procurement processes. These investments can help to generate better quality demand from utilities for digital solutions and ensure the most cost-effective solutions are adopted. Here, national governments, regulators and development partners all have a role to play. Requiring complex solutions to be presented in person by bidders, involving specialist national bodies (such as the ICT Authority in Kenya) and focusing capacity building on utility managers’ digital skills,

can all support more effective decision making in procurement processes and support the adoption of effective innovations.

Consumer trust can make or break a new technology, especially if low adoption rates undermine the value the solution can deliver. In the experience of the GSMA, customer adoption is typically slower than innovators plan. Across GSMA Innovation Fund grants, we have learned that investments in promotion and customer education are essential to driving widespread uptake of a new technology and/or service model, and that these investments need to be planned for from the start. Although utilities typically have the most direct responsibility for this, collaborating with a range of education partners can be extremely valuable. For three of Wonderkid’s partner utilities that we spoke with, 53 per cent of customers still come to their offices as they believe that complaints will be resolved faster when made face-to-face. Wonderkid drives adoption of its solution by providing training to both staff and users when the service is implemented. Failing to invest in customer education can create a barrier to scale because if the tools are not being widely used, the ability of innovators to demonstrate value is undermined. Conversely, actively identifying and addressing adoption barriers has been shown across GSMA grants to support rapid uptake of services.

### Change management

Digitalisation requires utilities to manage change in their organisation, especially when digital tools replace tasks that have always been completed manually. If not actively managed, these issues can become barriers to adoption. When introducing its tools, Wonderkid organises meetings with senior management and assigns project champions from different departments. To engage with the highly unionised workforce in Kenya’s water sector, Wonderkid conducts in-depth training sessions with employees to not only build their skills, but also to alleviate fears about digitalisation displacing their jobs. Although it can take significant political will, in Wonderkid’s experience, the tools usually help organisations better understand their operational issues, reallocate staff and boost service efficiency. Innovators might need to help utility partners think through staff reallocation for the

solution to be successful, as utility managers may be unable to terminate government employees, either for political or legal reasons.

### Service quality

When a solution is being scaled, it is evaluated by the value it delivers. However, many utilities often lack robust system performance, which can obscure the benefits of a digital tool and act as a barrier to adoption. B2B service providers need to invest in developing a value proposition that clearly demonstrates the benefits of their solution. In developing a strong value proposition, innovators also need to recognise the costs associated with adopting a solution. Since many utilities lack working capital and are limited by how much they can raise tariffs, B2B service providers must ensure that solutions will pay for themselves, either through efficiency gains or better revenue collection.

Both Wonderkid and CityTaps have developed business models that recognise these affordability barriers. Wonderkid initially charged a higher upfront service fee, but once it became clear that this created a barrier to adoption for utilities, it transitioned to a smaller recurring fee. CityTaps, by contrast, uses, among other strategies, a leasing model to scale and keep its PAYG business model sustainable.<sup>25</sup> Since the PAYG system already manages customer payments, it can also be used to collect lease instalment payments. Providing this security to utilities attracts the investment needed for wide-scale meter deployment and, hopefully, network expansion.

While poor water network infrastructure presents an opportunity to scale digital solutions, it can also create a barrier to meaningful improvements. For example, utilities often use thin plastic pipes that cannot sustain water pressure and eventually start leaking. While remote monitoring can help to identify leaks and support repairs, the problem of leaks will persist if infrastructure is not upgraded.

To avoid this potential pitfall, at minimum, these limitations need to be identified so there is a realistic expectation of the benefits. In a best-case scenario,

digital solutions would be deployed alongside a broader strategy for infrastructure improvement. This would encourage a shift towards virtuous cycles of service improvement. In many emerging markets, large-scale infrastructure improvements will involve financing from DFIs. Aligning these investments with a utility’s digitalisation process is likely to generate more benefits than would have been realised independently.

### Scaling capital

For any start-up, securing the necessary capital is a critical barrier. As discussed earlier, few utilities in emerging markets are likely to have sufficient capital to scale digital solutions independently. In Kenya, despite having regulation that enables the water sector to take commercial loans, there are few examples of such transactions. In this context, funding can play a significant role in supporting the adoption of innovations that will pay off in the long run. Today, 60 per cent of Wonderkid’s utilities receive donor-funding to pay for Wonderkid’s service, and 40 per cent pay for it themselves.

Blended finance, a combination of public and private investment, is increasingly addressing this gap. This approach uses public and development financing, typically provided at concessional rates, to de-risk and attract commercial bank loans by providing guarantees and demonstrating creditworthiness. Although there are still few cases of blended finance being deployed at scale in the water and sanitation sector,<sup>26</sup> digitalisation has the potential to change that. Digital tools can help identify and reduce losses, provide operational efficiencies by monitoring implementation and the quality of service delivery and, to a degree, ensure financial returns through better revenue collection and tracking methods. Thus, once solutions have been validated and are preparing to scale, public funding can play an important role in attracting the additional private sector funding needed to scale these solutions in frontier markets. Innovative financing methods, such as results-based financing and development impact bonds, are also well suited to contexts where there are clear and measurable impacts from investments.

25. CityTaps uses a lease-to-own model. The leasing period is usually 18 to 48 months. At the end of the leasing period, the equipment is transferred to the utility for the lifetime of the system (~10 years).

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



### 3.4 LOOKING FORWARD: WIDESPREAD ADOPTION

Both Wonderkid and CityTaps are still in the process of scaling their solutions, which involves accessing new markets and refining their current offerings and, for Wonderkid, developing new products. The text box below outlines the current priorities of the grantees.

As B2B providers, poor revenue collection and management by utilities present a risk for both Wonderkid and CityTaps to scale their business. It is a persistent struggle for Wonderkid to collect revenue from utilities. Our research revealed that while many utilities want to adopt these tools, they cannot afford to yet. The key challenge for CityTaps is that PAYG smart meters are significantly more expensive than traditional

meters. However, there is potential to reduce operational costs elsewhere. To help water utilities respond to this challenge, CityTaps works with them to develop a financial model that ensures return on investment, namely, by rolling out smart meters to households and businesses that deliver the greatest value first.

Despite these challenges, both organisations have a path to commercial sustainability. Their common aim is to help staff and customers become so comfortable using the digital tools that these become the norm. As we have seen with Wonderkid, some utilities no longer accept cash payments, and CityTaps requires mobile money payments from all utility customers connected to their meters. Other tools will need to be adopted and mainstreamed for the service to become fully embedded (e.g. logging all complaints via mobile rather than in person). This process will take time and on-going training.

#### Current priorities of Wonderkid and CityTaps

In 2020, CityTaps plans to scale up to deploy 18,000 CTSuites. The company is also planning to raise a debt instrument of \$3 to \$5 million to continue rolling out its PAYG leasing business model to utilities and reach three million people by the end of 2023.

CityTaps has three main priorities:

- To integrate the latest IoT protocol supported by MNOs as an alternative to LoRaWAN radio networks;
- To drive expansion across Latin America and Asia with pilot projects already running in Ecuador and Singapore; and
- To integrate international remittance channels on its platform to pay for water services (for example, Orange Money can be used by the African diaspora living in Europe to pay the water bills of relatives in Africa).

Wonderkid plans to prioritise two key aspects of its business model:

- Expanding its enterprise solution offering: Currently, 40 utilities, the flexibility of its solution enables utilities to select modules based on their current needs, and they have the option to add more modules as their needs change. This option is preferred by large to medium-sized utilities that are keen for customised solutions to meet their unique requirements.
- Offering their products on a Software as a Service (SaaS) basis: The new SaaS option is a monthly subscription service designed for small to medium-sized utilities in urban and rural areas. This option is affordable, simple to configure for any utility ICT personnel and supported remotely by Wonderkid's technical teams.

## 4 Accelerating digital adoption in the water sector



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Fostering an environment that supports digital adoption requires collaboration across a range of actors. No single group can drive progress without working with others, and the promise of digitalisation is that it can deliver mutual benefits to multiple stakeholders. Based on the lessons outlined in this report, different stakeholders have distinct roles to play in scaling digital solutions that improve water service delivery.

## 1) Governments and regulators

As seen with Wonderkid in Kenya, the government played an instrumental role in driving the adoption of tools that allow benchmarking of utility performance. This is because holding utilities accountable for service delivery standards creates some of the necessary incentives to improve performance. Monitoring performance is key to identifying critical areas for improvement and understanding where digital tools can add value. Investing in and supporting the capacity of utilities to make informed procurement choices can help build confidence and trust in new technologies. With utilities often under financial pressure, these are important steps in determining which investments will be cost effective, and supporting their adoption.

When utilities are working to achieve targets, there is a risk that higher income areas will be prioritised to reach goals faster.<sup>27</sup> However, it is vital that regulators specify targets to provide service for low-income customers. Once these targets are set, digital tools can play an important role in the deployment of pro-poor services. As utilities become more efficient, they can reach even more poor households. Technologies that support PAYG models also enable utilities to connect consumers traditionally considered a credit risk.

## 2) Utilities

Utilities are at the centre of service delivery. Before they can digitalise operations, they need to first develop an institutional culture and vision<sup>28</sup> that supports digitalisation. This includes developing a clear vision and roadmap for digital adoption that is achieved through incremental steps. For example, identifying quick wins; creating a culture of leadership that embraces these tools and is willing to take appropriate risks and learn from failures; and then committing the investment

required for digital systems to succeed. Utilities in emerging markets often need to invest in digitalising their own customer accounts first before they can adopt more advanced digital tools, typically before or during a pilot, and prior to scaling.

Utilities play a key role in driving user adoption. Not only do they need to educate consumers about the tools, but they also need to create incentives for adoption. We have seen promotional campaigns and bonuses that encourage the use of digital tools increase adoption over the long term.

## 3) Innovators

While the adoption of new technologies delivers long-term rewards, it can be a slow process initially. Innovators that pioneer new solutions in the digital water sector in emerging markets will need to invest time and capital to drive adoption of their tools and educate consumers.

The commercialisation of a new innovation also requires time. Procurement processes in the water sector can be lengthy and dependent on regulatory buy-in. Innovators will need to learn how to overcome issues with capital costs and payments collection. Recognising that utilities in many markets are under financial pressure is essential to developing a viable business model. One way to do this is to develop an adaptable business model with flexible payment structures and revenue collection methods.

To build a partnership with a utility, it is vital to develop a strong value proposition that addresses their needs. Often, it must also be supported by strong evidence to attract large-scale investment. Innovators seeking partnerships with MNOs will also need to appeal to commercial interests as MNOs often focus on KPIs, and new engagements are expected to have an immediate return on investment. Due to the nature of their priorities, relationships between MNOs and innovators typically require a high level of engagement.

## 4) Mobile network operators

MNOs have already reached a level of scale at which they face fewer external barriers than smaller

organisations. However, start-ups are often closer to the problems they need to solve, have better access to data and insights and strong organisational drive. This puts them in a strong position to create new, mobile-enabled solutions to service delivery challenges.

For MNOs, partnerships with innovators deliver commercial benefits and brand value from supporting essential service delivery, while innovators benefit from an MNO's services and brand recognition. By offering water bill payments, MNOs enjoy the dual benefits of revenue from transaction volumes and potentially greater customer satisfaction. The GSMA report, *The Value of Pay-as-you-go Solar for Mobile Operators*, demonstrates that in five markets in Africa, around a quarter of PAYG solar customers either created or reactivated their mobile money accounts to receive the service. PAYG solar customers also increased their use of mobile money services beyond the payments for their solar system and, for the two markets where data was available, increased their internet penetration. This supported higher ARPU growth from these customers compared to a similar socio-economic group in four of the five markets. Although water doesn't support phone usage in the same way that energy supports charging, these findings underscore the value MNOs can derive from forging partnerships and developing products with utility service providers.

MNOs have the potential to contribute to financial inclusion and socio-economic gains. MNOs can benefit from transitioning towards a "payments as a platform" approach that connects consumers with third-party services across a range of industries and incorporates more partners and third parties in the platform. It involves lowering barriers for partnerships or creating a more accessible environment for third parties, and moving away from one-on-one negotiations and one-off third-party integrations.<sup>29</sup> It also enables a diversified revenue model supplemented by monetisation from adjacent services, such as revenue collection from utilities. This model relies on participation in broader financial services and technology ecosystems, and plug-and-play access to a mobile money service through APIs. These API portals allow businesses working with innovators to integrate their services with mobile money easily.

## 5) Donors, funders and investors

The estimated cost of achieving universal access to water and sanitation is \$114 billion by 2030.<sup>30</sup> Realising this will not only require more public investment and donor support, but more commercial financing of the water sector. Disruptive innovations can require public and philanthropic funding at early stages before reaching the maturity required to attract debt and equity finance.

The water sector needs innovative financing solutions. Results-based financing instruments, such as development impact bonds where repayment is contingent on specified outcomes, can play an important role. Innovators that use mobile technology are well placed to benefit from such financing as they are becoming increasingly sophisticated at measuring social impact digitally and using operational data. By providing credit lines, guarantees or co-investment, DFIs, donors and investors can make commercial investments more viable.

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

## Concluding remarks

No single actor can scale digitalisation without working with others. Governments, utilities, innovators, MNOs and donors all have unique capabilities and capacity, and it is only by working together that the full benefits of digitalisation can be realised. While new innovations are always emerging, there are already many viable technologies in the water sector that have yet to see widespread adoption. These technologies provide the opportunity to tackle long-standing and intractable challenges in the water sector, and benefit hundreds of millions of people who still lack access to a safe, affordable and reliable water source.

27. WSUP (2018), *Institutionalising pro-poor services: A new Key Performance Indicator for Kenyan utilities*.

28. The International Water Association (2019), *Digital Water: Industry Leaders Chart the Transformation Journey*.

29. GSMA Mobile Money (2020), *State of the Industry Report on Mobile Money*.

30. Hutton, G. and Varughese, M. (2016), *The Costs of Meeting the 2030 Sustainable Development Goal Targets on Drinking Water, Sanitation, and Hygiene*. World Bank.





**GSMA HEAD OFFICE**

Floor 2  
The Walbrook Building  
25 Walbrook  
London EC4N 8AF  
United Kingdom  
Tel: +44 (0)20 7356 0600  
Fax: +44 (0)20 7356 0601