

Background Document

City-wide Inclusive Water Supply

**Refocusing on Off-Grid Solutions for addressing
Sustainable Development Goal 6.1**

Global Study

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List of Abbreviations

Abbreviations	Full Forms
CAPEX	Capital Expenditure
CBO	Community-Based Organizations
EMM	eThekweni Metropolitan Municipality
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HH	Household
IBNET	International Benchmarking Network for Water and Sanitation Utilities
JMP	Joint Monitoring Programme
KIWASCO	Kisumu Water and Sewerage Company
KL	Kilo Litres
LGU	Local Government Units
LPCD	Litres Per Capita Per Day
LMS	Low Mechanized System
ML	Million Litres
MLD	Million Litres per Day
MSSF	Modular Slow Sand Filtration
MWA	Metropolitan Waterworks Authority, Bangkok
NGO	Non-Government Organization
NRW	Non-Revenue Water
O&M/OPEX	Operation and Maintenance Expenditure
ODA	Official Development Assistance
ODF	Official Development Finance
PPIAF	Public Private Infrastructure Advisory Facility
RO	Reverse Osmosis
SDG	Sustainable Development Goals
SSA	Sub – Saharan Africa
US\$	US Dollar
UF	Ultra-Filtration
UV	Ultra Violet
WASA	Water & Sewerage Authority
WASH	Water, Sanitation, and Hygiene
WSP	Water and Sanitation Program
WSUP	Water & Sanitation for Urban Poor

Executive Summary

Today there are just about 2.1 billion people without access to safely managed¹ water supplies – supplies which are safe, affordable and reliably available close to home (Sustainable Development Goal 6.1). Of these an estimated 676 million are urban dwellers who rely on off-grid supplies, including, ~495 million with ‘basic’ service level, ~73 million with ‘limited’ service level from an improved source, ~96 million with ‘unimproved’ service level from unprotected wells or springs, and ~12 million who abstract directly from surface water sources. Almost 80 percent of the 108 million people with unimproved services or surface sources are from just 16 countries.

The number of urban people reliant on off-grid supplies, which are not safely managed, has rapidly increased in the last 15 years and will continue to increase to 2030. A total of 277 million people entered this category since 2000 of which the majority (185 million) have been in South Asia and Sub-Saharan Africa. If the rate of providing piped supplies over the last 15 years continues for the next 15 years, and the urban population increases as projected by 1.2 billion, then the current 676 million will be joined by a further 300 million by 2030. In other words, by 2030 almost 1 billion people will come to rely on off-grid supplies which do not meet the JMP definition of safely managed. These troubling numbers exclude the significant population who are classified as rural but live on the periphery of urban areas and have urban characteristics and aspirations.

Not only are off-grid customers increasing, but they are also concentrated in the poorer segments of society. An analysis of 75 developing countries in Asia, Africa and Latin America showed that more than 68 percent of these customers came from the bottom two wealth quintiles (the poor and the poorest). Within these regions, many countries (24 of these 75 countries) have more than 80 percent such off-grid users from poor and poorest categories, for example, Vietnam, Thailand, Rwanda, Cambodia, Bangladesh, Peru, Columbia, Bolivia and Mozambique.

This situation arises because water utilities in rapidly urbanizing developing countries have been unable to keep pace with the urban growth. In fact, piped access reduced globally from 85.2 percent in 2000 to 82.9 percent in 2015, and this decline is even more pronounced in some rapidly urbanizing and poorer regions such as Sub-Saharan Urban Africa (down from 66.8 percent in 2000 to 56.3 percent by 2015) and urban South Asia (down from 71 percent to 66.3 percent).

Despite this declining access to piped supplies the urban utilities and their government owners have generally ignored the increasing numbers of off-grid households. The sector is captured by a single-minded focus on piped service delivery – which has been unable to deliver, and which will continue to fall behind urban growth, as a result of endemic governance, efficiency and financing challenges within the sector. This coupled with policy, land tenure, and related issues in the broader urban environment all conspire to leave the poor without access to piped water supplies. A laissez-faire attitude prevails in the sector leaving the off-grid customer to fend for themselves – with some exceptions such as Nairobi (public utility) and Manila (private utility).

Within this Laissez-Faire approach, a number of institutional arrangements for off-grid water services have arisen. These include local and internationally supported NGOs, a household who serves neighbours for a profit, or a small private provider that services a number of households. These providers are mostly dependant on the public utility for providing the water that they deliver to their customers. At the other extreme there are largish private providers who not only distribute water to the end-user but also has their own committed source arrangements.

These small service providers from the private sector operate as for-profit enterprises looking at water as one more business in their portfolio. Their businesses are small in scale, they are asset-light with minimal investments and they are accepting a range of regulatory, payment, water source and business disruption risks. Scale is an issue for the sustainability of these small service providers. They seem to serve a small number of households - from as few as 50 or so to a high of no more than 3000 households. Often, they are the main service providers. However, there are also instances of such small service providers being the aggregators/ intermediaries between the utilities and the users, operating under various types of licensing

¹ Safely managed as per JMP definitions

arrangements, including in most cases without licensing and illegally. There are also instances of international water NGOs who work with local NGOs/private service providers.

Notwithstanding the range of different delivery models, the off-grid services suffer from serious quality, quantity and affordability issues. Studies have shown that 30 to 75 percent of off-grid supplies are not free from faecal contamination. Most of the off-grid suppliers very active in the cities of Latin America, Africa and Asia charge rates much higher than the utility tariffs thus making the water unaffordable to the poorer people – at least at some basic quantity that might be considered sufficient for a household. These high rates are not usually a result of “price gouging” but simply that the service delivery method is inefficient, lacks scale, and does not benefit from the subsidies for piped customers.

The singled minded focus on providing customers through piped supplies results in those piped customers benefiting from the significant subsidies that flow into the sector. It typically costs around US\$265 per capita to provide a piped supply to a household including abstraction, treatment, transmission, storage and distribution (so called source to tap). Financing of these costs is often on-granted to the beneficiary utility which results in an equivalent annualized subsidy of US \$25.6 per person. Making the situation worse in many developing countries are the operational subsidies provided to city and government utilities which amount to a further US\$16.6 per capita per year. Thus, whilst an individual with access to a piped connection gets an average annual subsidy of US\$ 42 the unconnected, who are generally the poor, get zero subsidy.

Given the growing number of off-grid households, their poverty levels, the poor quality of service, and the almost complete lack of financial or institutional support from Governments, it is now critical that we re-examine the traditional focus on adding piped connections and start looking instead at how ‘off-grid’ solutions could be “reimagined” as a complementary solution towards achieving SDG Goals by 2030. This would mean addressing the major administrative and institutional challenges currently facing the off-grid (fragmented responsibilities coupled with inadequate planning, legislative and regulatory issues, land tenure issues, quality and reliability of source and distributional inefficiencies), the financial constraints (access to finance for off-grid providers, subsidies, affordability for basic amounts of water), and also the technical constraints (how to efficiently deliver, and subsequently store at the household level). *Quality of water is a big issue in the off-grid market in several cities in developing countries when it is untreated or partially treated.* There is no guarantee that water is of acceptable quality when it comes in the pipes, particularly intermittently, but public utilities can be at least held accountable for poor quality, unlike in off-grid market.

A complementary off-grid approach would make sense for countries striving to achieve the SDGs. Capital is limited and so too are subsidies. This report suggests that the “source to tap” investment cost for an off-grid supply² would be US\$132/person compared to the on-grid cost of US \$265/person. Whilst most of the latter costs are covered by public funds the former would include a mix of public and private funds – this mobilizing additional sources of funding into the sector. Subsidy policy is complex but reconsidering use of public subsidies towards the idea of providing a basic water service to households (as opposed to a piped service to households), using whatever service delivery method is most appropriate, may provide opportunities to target those subsidies to the poor – who are mostly off-grid.

One approach presented in this report would leverage the private sector and bring in complementarity between public and private sectors. The approach envisages a ‘vertical separation of the water services value chain’ with public utilities handling the upstream activities of abstraction / transmission / treatment and then selling bulk treated water to the private providers who would be responsible for the downstream ‘off-grid distribution’ arrangement. The precise mix of on-grid and off-grid solution would be determined on a case by case basis. Critically this approach would require significant shifts in mindsets on all stakeholders and include capacity building of traditional utilities and private providers to work together for the public good.

There are several complex issues that need to be addressed in moving towards this mixed approach. These relate to **Policy**: how should the governments define their programs and priorities with respect to grid and off-grid solutions? **Legal & regulatory**: are the existing laws adequate for new policies and what changes/new laws are required? Who will set the standards and who will monitor the adherence to standards? Who will regulate and what will they regulate- licensing, service quality, pricing etc.?, **Institutional**: what should be the roles and responsibilities of the public and private sector be in service

² 40 LPCD for Off-grid compared to 100 LPCD for piped system

provision with respect to off-grid supply? what roles should NGOs play? how can competition be introduced in the market?, **Technical:** how should governments ensure that water is treated using the right technology that results in acceptable quality at the users' end? can the technologies chosen work at scale? how cost-effective are these technologies? how should investments be prioritized?, **Capacity:** what capacity building support is required to bring in more professionalism in the sector? how can support be provided to bring about a change in mind-sets of the government, utility, and citizens on accepting their changed roles and responsibilities? **Financing:** where will governments get the funds to finance capex? who will finance the capex required by private players? who bears the recurring operating costs and who gets the subsidy, and how should the subsidies be targeted? how should the recurring subsidies be financed? how can technology and institutions make it easier for the users to buy water or get subsidy?

At the heart of the challenge would be rebalancing of the presently distorted subsidy regime which directs the subsidy to the relatively wealthy who have piped supplies. For example, in the off-grid option, could subsidies be targeted better and given directly to the poor users rather than to the inefficient utilities which service both the rich and poor? Giving subsidy directly to the poor and giving them the choice to choose any available supplier from the market will also enhance competition and get better services.

The purpose of this report is to present a more inclusive vision of urban water supplies where residents have access to a basic level of service which is provided at an affordable price regardless of method of service delivery. It goes against the historic pipe-centric approach and the entrenched interests of many stakeholders – governments/donors/utilities (who want to expand the piped networks), private entrepreneurs (who may prefer to remain unregulated), and NGOs and activists (who see opportunities to blame governments for shirking their responsibilities or the private sector for exploiting the poor).

The challenges going forwards start with a mindset shift that accepts off-grid supplies as an equal partner to piped supplies in meeting the SDGs. If that idea can be broadly accepted then a set of next steps can be envisaged, and which the international community can support, leading to a future where all urban dwellers will receive an affordable service which meets their basic needs, and is safely managed. These next steps would include:

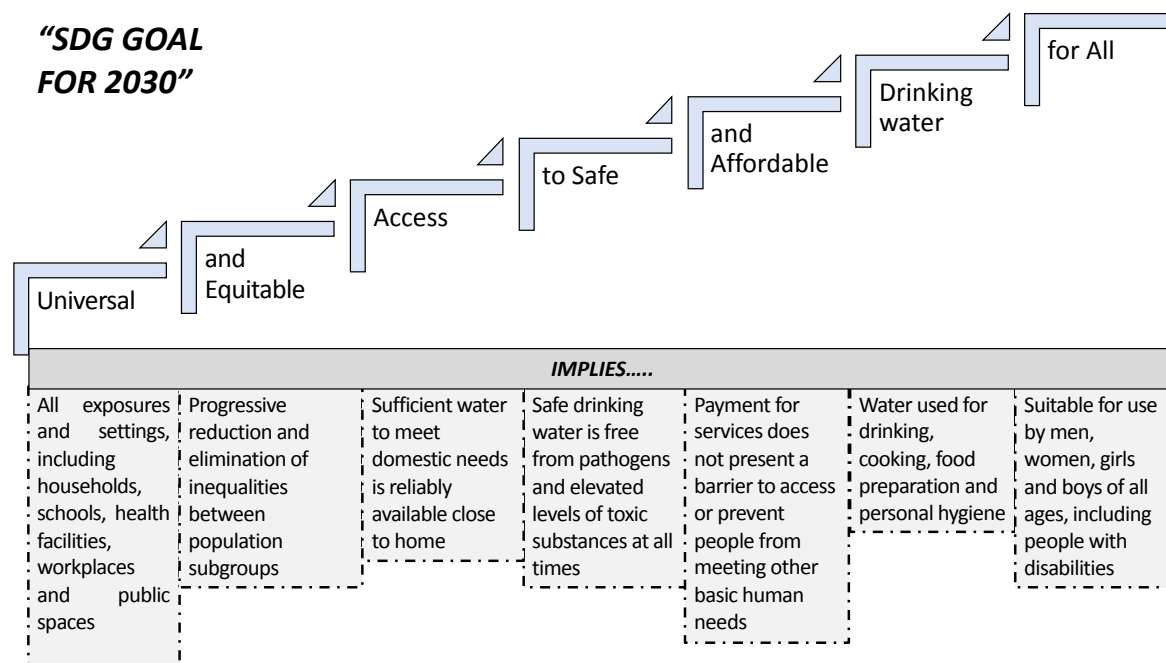
- Drafting policy text to capture a shift towards SDG 6.1 compliant service delivery as the government's end goal - not just the provision of piped services
- Gathering more data to better understand the costs, charges, service standards (quality and quantity), and affordability associated with off-grid services
- Revisiting subsidy policy to develop a more equitable model that will facilitate investment in SDG6.1 compliant off-grid solutions which are affordable
- Refining the indicative institutional models presented in this report
- Rethinking regulation and regulatory approaches to off-grid service providers
- Investigating more innovative technical solutions that can provide adequate quantities and qualities of water to households and for households to be able to safely manage that water on-site

The goal of this work is to set out the potential for a reimagined off-grid service sector which is SDG 6.1 compliant providing sufficient safely managed water, accessible at the household level, and which is affordable to customers.

1. Introduction

Sustainable Development Goals (SDGs) includes SDG Goal 6 - “Ensure availability and sustainable management of Water and Sanitation for All”, and within that higher-level objective, the SDG Goal 6.1 specifies that “by 2030, achieve universal and equitable access to safe and affordable drinking water for all”. The Joint Monitoring Programme (JMP)³ has elaborated on SDG 6.1 and related terminologies as shown below in Figure 1.

Figure 1: JMP Interpretation of Terms Used in SDG Target 6.1



Source: JMP 2017

This goal is already challenging given that, at the end of the MDG period, ~ 663 million people did not have access to improved water sources. Under the more stringent requirements of safely managed water under SDG 6.1 the JMP⁴ has estimated the current gap of those without safely managed water to be ~2.1 billion people globally (both urban and rural). Addressing this backlog is made even more challenging given the continuing rapid urbanization in developing countries, particularly in Asia and Africa, where many cities are growing at three times the rate of the rest of the world’s cities. For example, while cities with over half a million people grew at 2.4 percent (2000-2016), 46 of the 47 high growth cities (> 6percent growth) were in Asia and Africa. In the next 15 years, the number of cities with over 500,000 people is projected to go up by 80 percent in Africa and by 30 percent in Asia⁵.

Meeting the goal will therefore require new ways of thinking and in particular to consider how to develop integrated solutions that can mix traditional piped based approaches with off-grid solutions. This study looks particularly at the

³ The WHO/UNICEF Joint Monitoring Programme (JMP) builds on monitoring activities carried out by WHO, with the objective to provide regular global reports on drinking-water and sanitation coverage to facilitate sector planning and management.

⁴ This report uses JMP service level definitions with respect to safely-managed, basic, limited, unimproved, and no service.

⁵ World’s Cities in 2016, United Nations, 2016.

challenges of meeting the SDG 6.1 from the perspective of off-grid services which are currently being used by a large and increasing proportion of the urban population. For this assessment, two key distinct areas⁶ with high current or potential off-grid service dependence have been analyzed - core urban areas and peri-urban areas. The core urban areas comprise primarily the slums or poor population pockets which have not been covered by conventional piped systems. The peri-urban areas are characterized, on the one hand, by the displacement of population, industries and services, from the city centre to the periphery, resulting in economically rich growth centres, while, on the other hand, by slow or poor absorption of these areas into provisioning of basic urban facilities or services by local bodies, resulting in high dependence on independent off-grid service providers.

Although not specifically addressed in this report there are significant groups of people who currently reside outside the city's jurisdictional limits and have urban characteristics and aspirations but lack infrastructure for basic services – the rural interface. Even if the current rural interface population gets absorbed in future urban areas, and hence get accounted for in the urban population, lack of safely managed water in such rural interface areas will always be a dynamic issue with respect to meeting the SDG goals.

The objective of this report is to better understand the scale of the off-grid challenge (i.e. the number of people who are unlikely to benefit from a house connection by 2030 - which is assumed a minimum requirement to meet SDG6.1), to look at current off-grid solutions and the challenges in providing off-grid services, and to set out some possible options for how to build off-grid services that are SDG6.1 compliant. At its heart this is a scoping study which can provide the foundation for follow on work that would lead to “reimagined” off-grid service delivery arrangements that complement piped systems – not as a sub-optimal solution but as an acceptable alternative which will ensure all urban residents have “*equitable access to safe and affordable drinking water*”. The report is organized into the following sections:

- Section 2 provides a baseline assessment and trend analysis of the number of urban residents who receive off-grid services, i.e. without a piped household connection.
- Section 3 considers the key challenges in delivering water services to off-grid population.
- Section 4 focuses on the current institutional arrangements in various countries in providing water supply services to the off-grid population.
- Section 5 sets out various scenarios, strategies and technical options for achieving SDG Goals for off-grid customers.
- Section 6 offers suggestions for an institutional framework for the off-grid service providers.
- Section 7 analyzes the financial implications of various off-grid scenarios, including inequity in current subsidies to on-grid and off-grid customers.
- Section 8 concludes by setting out the next stage of work and key issues that need to be addressed going forward.

⁶ There are varying definitions of what constitutes peri-urban used by different global agencies like UN and OECD. JMP WASH database used here includes core urban as well as peri-urban numbers classified as urban (jointly referred as ‘Urban’ in the analysis). The analysis on Rural interface has been presented in Annex 1.

2. Significant and Growing Urban Population Without Safely Managed Water

2.1 Over 676 million urban people population served by off-grid still without safely managed water

Cumulatively, 676 million people globally depend on off-grid arrangements with varying level of services, ranging from basic to surface water. In setting the SDG 6.1 baseline the JMP has a New Ladder for Household Drinking Water Services to measure progress on drinking water goals, as shown in Figure 2. The JMP ladder captures the number of urban residents receiving each level of service, including through off-grid solutions. Almost all those urban people receiving safely managed services (about 3374 million) have access to piped supplies, while those with limited, unimproved or surface water services rely on off-grid solutions. Further, while the largest group which receive basic level of service are predominantly served by piped arrangements, nearly 495 million people have an off-grid dependence.

Figure 2: New JMP Ladder for Urban Household Drinking Water

n

		2015 (Urban Population in Millions)	2015 – Off grid (Urban Population in Millions)	
Safely Managed	• Drinking water from an improved source is located on premises, available when needed and free of faecal and priority chemical contamination.	3374		
Basic	• Drinking water from an improved source provided collection time is not more than 30 minutes for a roundtrip including queuing	3782	495	676 Million urban people depend on Off-grid Solutions
Limited	• Drinking water from an improved source where collection time exceeds over 30 minutes for a roundtrip to collect water, including queuing	73	73	
Unimproved	• Drinking water from an unprotected dug well or unprotected spring	96	96	
Surface Water	• Drinking water collected directly from a river, dam, pond, stream, canal or irrigation channel	12	12	
Total Urban Population		3963	676	

Analysis by study team; Source: JMP 2017

The above numbers are from JMP WASH database. Off-grid here refers to non-piped services. JMP database provides data of Non-piped ‘improved’ services only and *not of all non-piped served population*. The 12 million people who depend on direct surface water are classified as non-piped, and similarly the 96 million people who get ‘unimproved’ water and 73 million people getting ‘limited’ services as per JMP definitions above are classified as non-piped. According to JMP database, the total global urban non-piped population receiving improved water is 568 million. The global numbers for non-piped safely managed is not available. The authors make a reasonable assumption here that this 568 million people are getting either ‘limited’ or ‘basic’ services within the improved category. Thus 495 million (568

million less 73 million limited) are classified as non-piped population getting ‘basic’ services in the above chart. It may be noted that a small percentage of these off-grid users may have safely managed water, as they may have improved off-grid source on premises providing adequate quality water. However, this global data is not available from JMP. Similarly, a small percentage of piped users may also be actually lacking safely managed water, as they may have pipes on premises, but water may not be available to them when needed or they may not have quality water as per JMP definition of safely managed. Thus, non-piped (off-grid) urban population adds up to 676 million (12+96+73+495).

It is generally assumed that those with only basic service levels, but connected to piped systems, can move to safely managed services through improved management and / or investments to existing systems. *The challenge facing the sector is whether all the 676 million people with off-grid supplies in 2015 can be lifted to the safely managed level by 2030 – either through piped systems or improvements in the off-grid arrangements.* Unfortunately, the outlook on providing access to piped system does not look promising, considering that the off-grid population has increased rapidly by 277 million people in the last 15 years. Of these, 185 million were from South Asia and Sub-Saharan Africa alone due to high slum population and rapid expansion of urban areas without matching improvements in water supply services.

Water utilities in the rapidly urbanizing developing countries have been unable to keep pace with the urban growth. While water utilities and local governments have focused their investments and efforts on increasing piped access, the growth of piped access is not keeping up with the rapidly growing urban population. In fact, piped access reduced globally from 85.2 percent (in 2000) to 82.9 percent (in 2015) and this decline is even more pronounced in some rapidly urbanizing and poorer regions such as Sub-Saharan Urban Africa (down from 66.8 percent in 2000 to 56.3 percent by 2015) and urban South Asia (down from 71 percent to 66.3 percent), as can be seen in Figure 3. The declining trends of piped access are more pronounced when looking at specific countries. For example, in Indonesia, it went down from 37 percent to 25 percent, and in Nigeria, it fell from 17 percent to less than 12 percent. The result is an ever-increasing number of people accessing off-grid services that do not meet SDG 6.1 requirement of safely managed services.

Water utilities and governments have not only been unable to sustain or improve levels of piped access, but they have also not considered how to make up for this by improving off-grid solutions. Figure 3 shows the declining trends in access to piped connections, highlighting several regions including Sub-Saharan Africa, Central and Southern Asia, where there is prominent decline in piped access, often from an already low base. One of the reasons is that city boundaries expand to include the fast-growing peri-urban areas and adjoining towns whilst the boundary of the incumbent water utility remain fixed. Such instances are evident in Bangalore and Chennai in India, Nairobi in Kenya, Jakarta in Indonesia, Lagos in Nigeria, Lima in Peru and Buenos Aires in Argentina. These peripheral areas are often unable to access piped supplies of the core urban area and must rely instead on off-grid solutions - yet city governments have not developed solutions that address this service gap.

2.2 Off-grid people have access to water – but they suffer from serious quantity, quality and affordability issues

Out of 676 million in urban areas without safely managed piped water, about 568 million have limited or basic services, and suffer from inadequate quantity, poor quality and often high prices through off-grid service providers. The quantities received from off-grid suppliers are generally low, except in some cities, mainly due to the high price, with consumers typically limiting use to just one or two 20 litre cans (or buckets) per day – below what might be considered a basic amount for household usage. Furthermore, studies⁷ have shown that, in most of the developing countries, 30 to 75 percent of the people are using off-grid water which is not free from faecal contamination. Finally,

⁷ JMP Thematic Reports

most of the off-grid suppliers are private and unregulated players, charging rates higher⁸ than the utility tariffs, making water unaffordable to the poorer people at quantities enjoyed by their pipe supplied counterparts. While users with piped water pay 1 to 3 percent of their household income for water, off-grid users are projected to pay 10 percent to 25 percent for a basic level of service⁹.

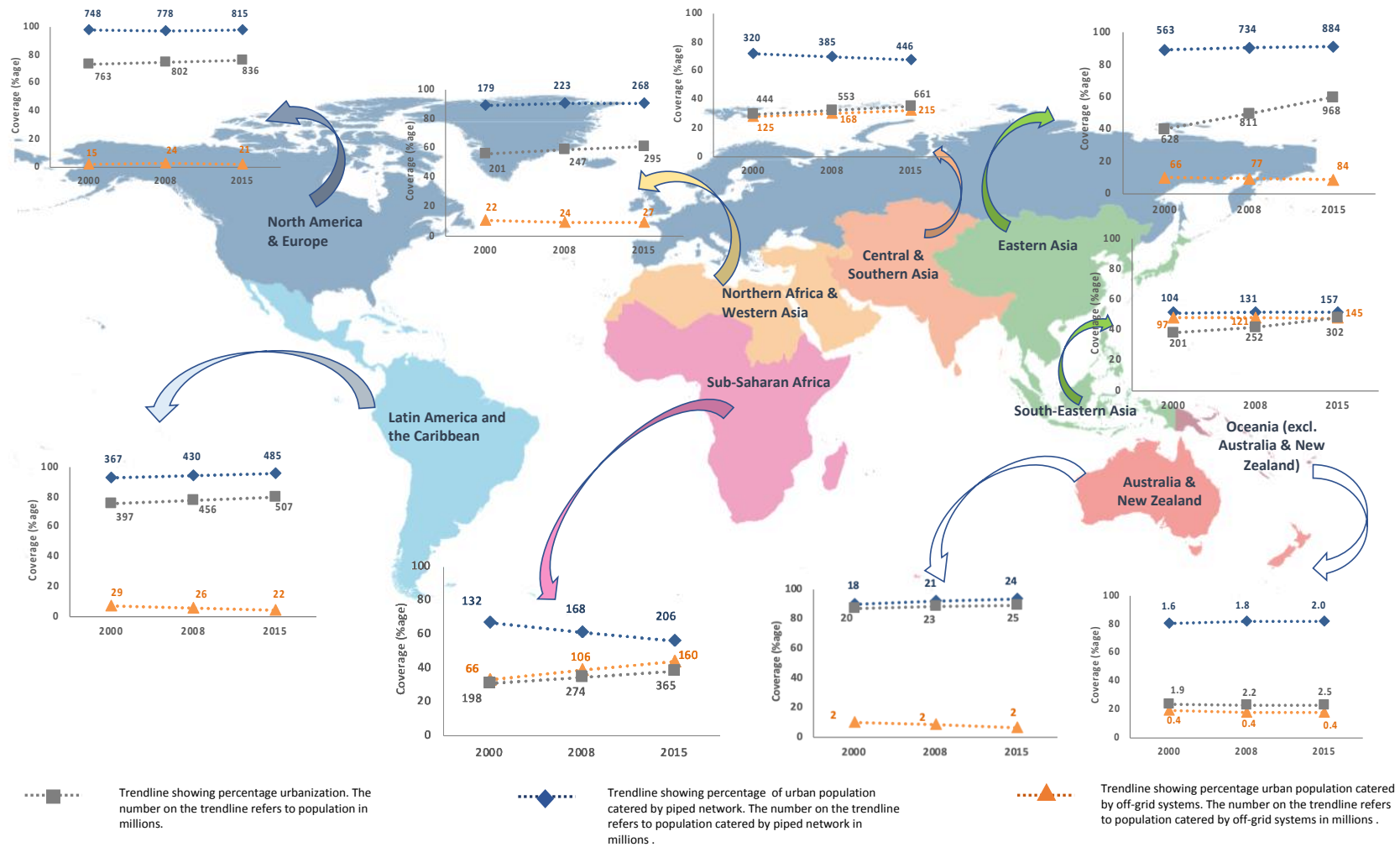
In the urban areas, a significant 108 million are not served by anyone at all largely in Sub-Saharan Africa and Asia.

As many as 85 million of these 108 million are from just 16 countries including China (28 million), India (21 million), Nigeria (7.3 million), DRC (5.2 million) and Pakistan (5 million). Some countries such as Mozambique, Madagascar, Zambia and DRC have close to 40percent of their urban population without any improved water services. Similarly, there is ample case study and city specific data to show that peri-urban areas have much lower levels water services than the core city areas. For example, the Africa Cities Report that examined all major cities in Africa (such as Dar es Salam, Cote de Ivory Cities, San Pedro, Bouake, Abidjan, Accra, Khumasi etc.) concludes that....” *Infrastructure and public services are concentrated in central areas and formal neighbourhoods in Africa’s cities, where access to water and electricity expanded between 1997 and 2013. Access to services declines rapidly once one leaves the center, however; peri-urban areas and informal neighbourhoods have limited access to basic services.*”

⁸ The higher rates typically result from lack of subsidy that is provided to the water providers – and not from price gouging as some speculate.

⁹ See Table 6 for details on affordability.

Figure 3: Globally, piped access is declining and dependence on off-grid is increasing in urban areas



Source: Progress on Drinking Water Sanitation and Hygiene- Update and SDG Baselines, The WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP)2017

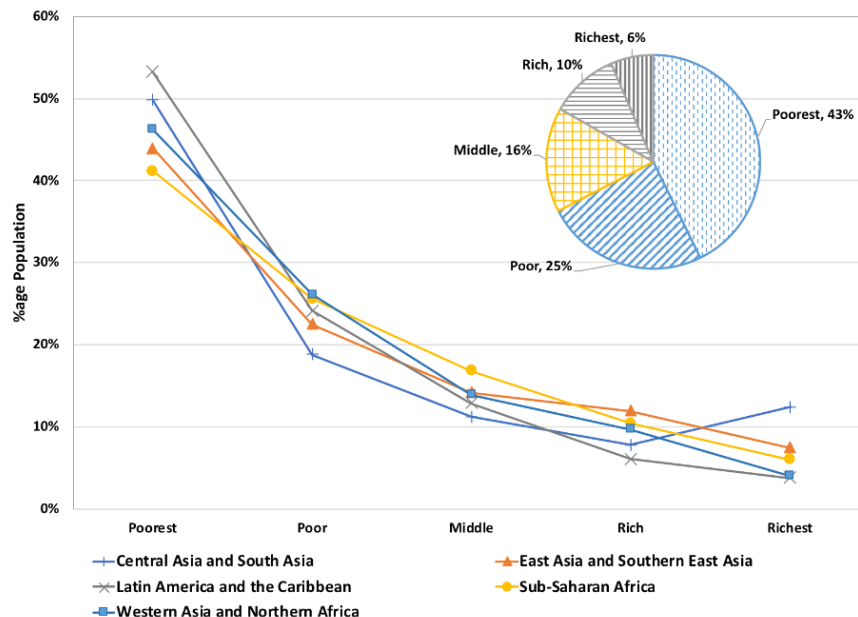
2.3 At the same time governments continue to subsidize the sector – but only that fortunate part of the population that receives piped services

It is paradoxical that while the piped access is declining and the urban population without adequate water services is increasing, governments and utilities continue to focus their limited capital only on expanding pipe networks. During 2000-2015, developing countries spent around US\$ 2.5 billion a year on investments in urban water supply¹⁰. This is a substantial amount, albeit insufficient for the investment needs of the sector, but importantly this money is typically provided by governments to utilities as grants. As a result, a significant capital subsidy is being provided to those that have access to a piped network.

At the same time, it is only the piped customers who get additional operational subsidies. Based on IBNET data 2014 this operating subsidy works out to about US\$ 16 per capita/year¹¹, or an average of US\$ 80 per household per year, indirectly through utility receiving the subsidy. This is in addition to fully subsidised capital investments noted above. At the same time the unconnected and generally the poor get zero subsidy. This situation will only get worse. Going forward, these countries will end up spending an increasing level of subsidies over the next several years as they not only have to continue to subsidize existing piped users but also new piped users who will access the system in the future.

It is also important to understand who are the fortunate (piped) and unfortunate (off-grid) urban customers. For example, in Port Moresby, the capital city of Papua New Guinea over half the people, mostly poor, living in informal settlements survive with inadequate and poor quality off-grid water solutions. An analysis of JMP WASH database of 75 developing countries around the world reveals that 68% of urban people without improved water or with limited services and dependent on off-grid belong to the urban poorest/ poor.

Figure 4: Profile of Urban Population with Unimproved Water (Asia/Africa/Latin America)



Within these regions, many countries (24 of these 75 countries) have more than 80 percent such off-grid users from poor and poorest categories, for example, Vietnam, Thailand, Rwanda, Cambodia, Bangladesh, Peru, Columbia, Bolivia and Mozambique. This can be seen in Figure 4 which shows an analysis of JMP data from 75 developing countries' off-grid populations in Africa, Asia and Latin America that do not receive an improved water supply (from surface water or

other unimproved sources or has limited off-grid services).

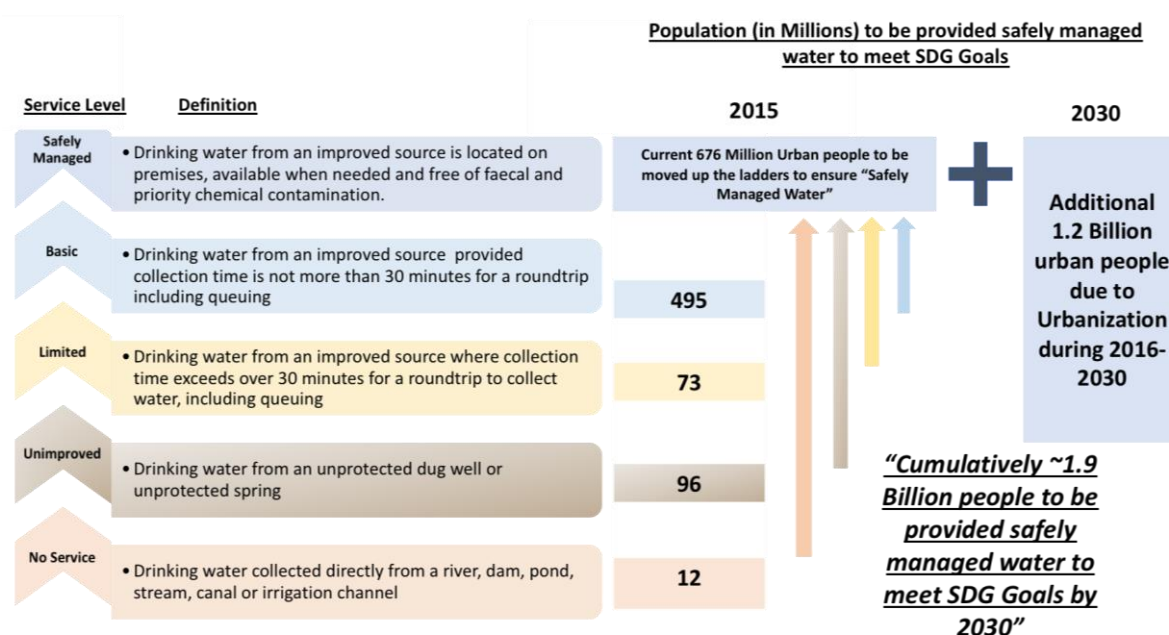
¹⁰ World Bank 2017, Amanda Goksu et.al.

¹¹ IBNET 2014 Data shows a median O & M cost of \$0.7/KL and median cost recovery of 35% resulting in subsidy of 65%

2.4 Size of the challenge is growing: 1.9 billion urban residents need to be provided safely managed water by 2030

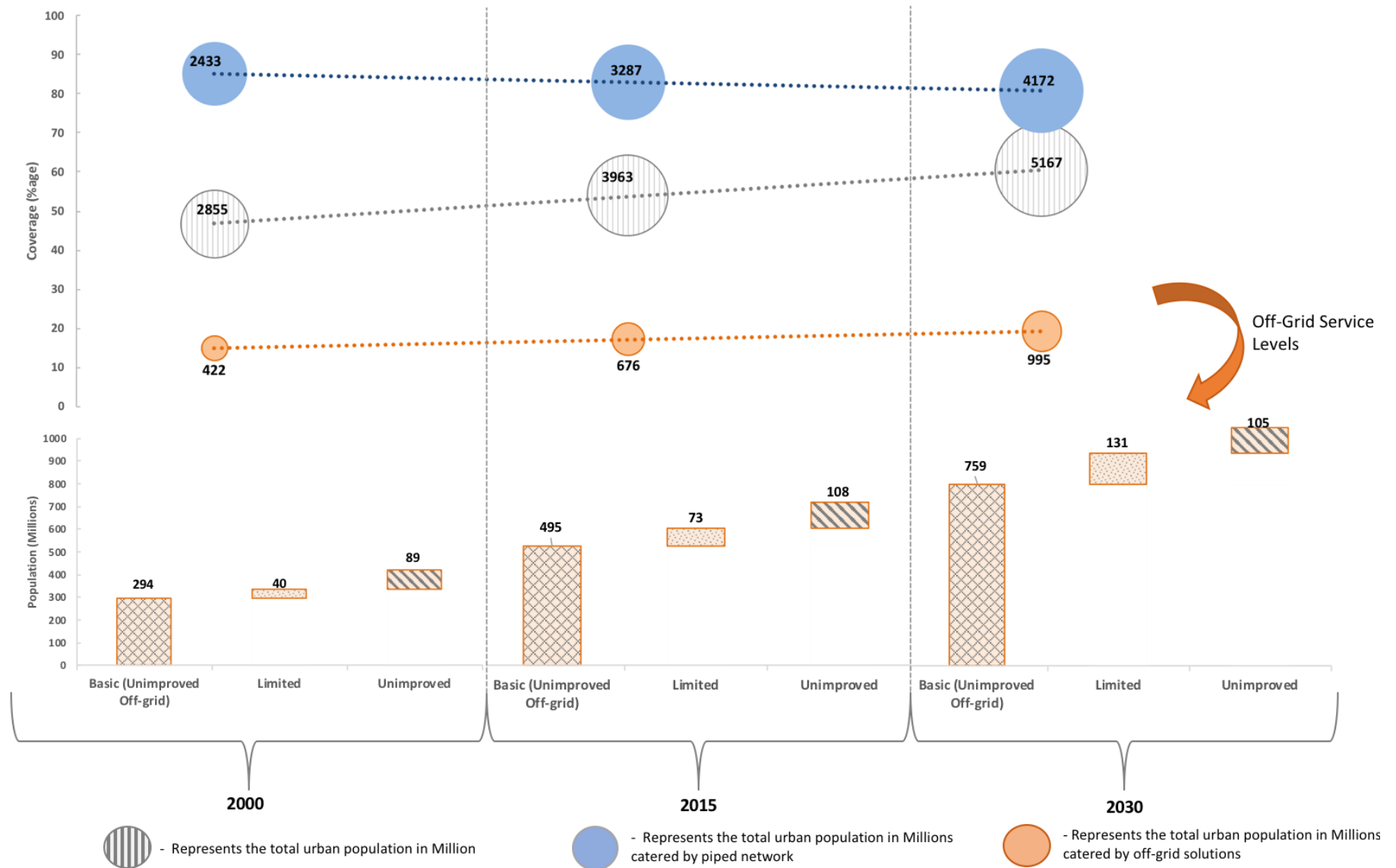
Globally, by 2030, about 1.9 billion people need to be moved up the JMP ladder and provided safely managed water supply to meet SDG 6.1. Based on JMP data these comprise 676 million urban off-grid people as of 2015, and taking into consideration the UN population growth data, an additional ~1.20 billion is anticipated urban population during the period 2016-2030. Many may be fortunate and gain access to piped supply, but a large and growing number will rely on off-grid solutions. If the number of people gaining access to piped services is assumed to be the same from 2015 to 2030 as it was from 2000 to 2015 (i.e. 900 million) then the remaining population in 2030 without access to piped water will be around 1 billion (Figure 5).

Figure 5: Magnitude of the problem to meet SDG Goal 6.1



The global average hides the impact at the individual country level where the decreasing trends of piped network and increasing trends of off-grid solutions become even more significant. If we assume numbers gaining access to piped supplies from 2015 to 2030 is the same as from 2000 to 2015 and taking into consideration the growth in population during 2015 to 2030, the 2030 projections are presented in Figure 6. Although the declining growth of piped connections vary significantly and widely from country to country, our analysis shows the future of piped connection growth looks quite bleak if the past 15 years trends were to continue. African countries like Nigeria, Algeria, Kenya and Tanzania and Asian countries like Philippines and Indonesia clearly stand out for their declining performance. In Peru between 2000 and 2015, at least 2 million more urban people slipped into the no improved water category (about 35percent of incremental population) and Pakistan had 2.3 million urban people with no improved water in 2008 that more than doubled to 5 million by 2015. India had an increase of 35percent in its urban population with no access to safely managed water over 15 years to reach 21.2 million in 2015 despite several reforms and investments and may find it difficult to reach SDG targets if it continues the same path (Figure 7).

Figure 6: 2030 Projection of Global Urban Population Continuing without Safely Managed Water Supply



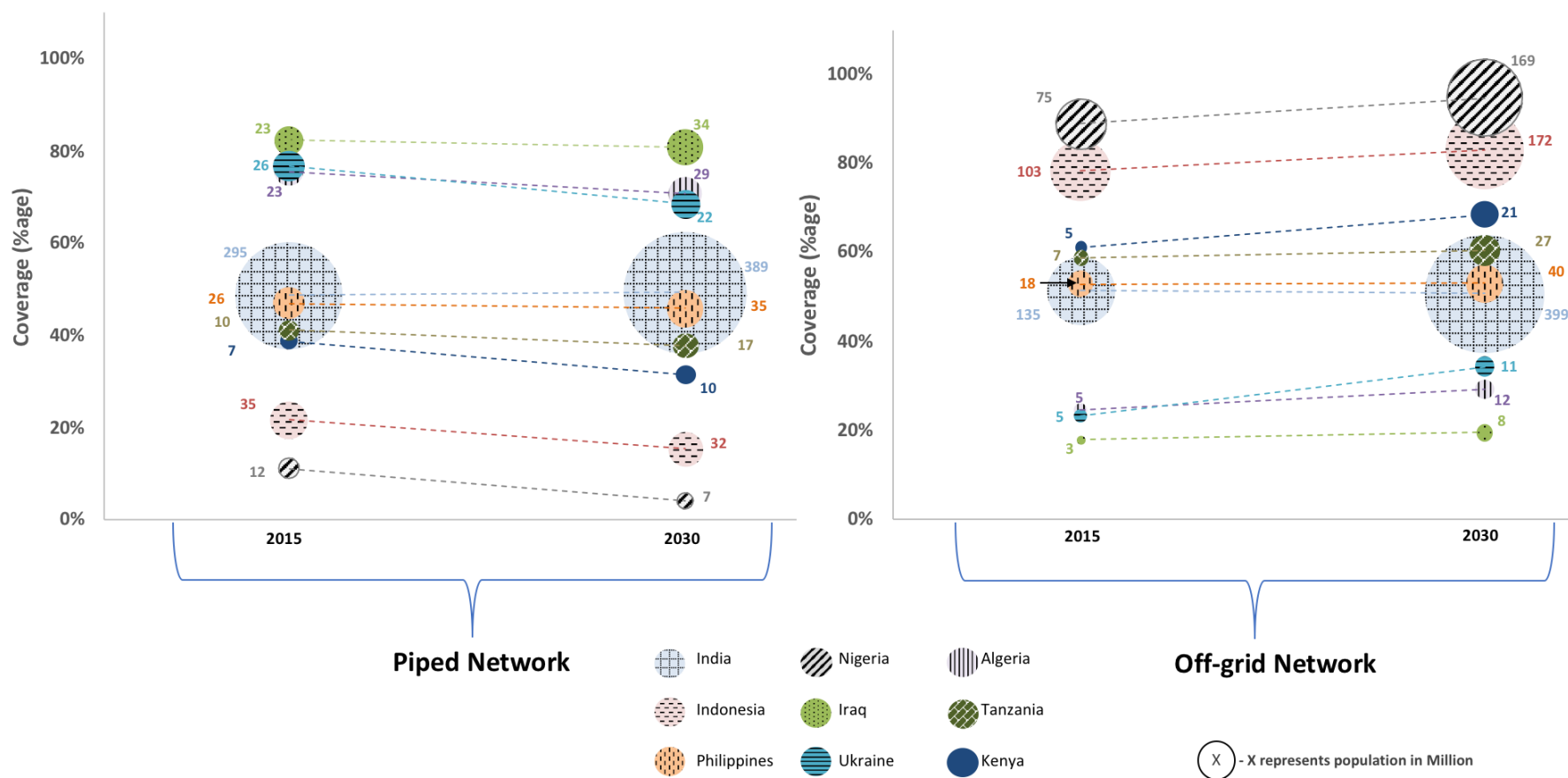
2.5 In conclusion – an increasing number in the urban population face a future with low quality, inadequate quantity and expensive water supplies which will not meet SDG6.1 requirement.

The preceding section highlights the following:

- Governments and utilities have focused attention almost exclusively on expanding access to piped water supply
- This approach has resulted in significant capital and operating subsidies being channelled to piped customers who are typically better off
- However, the number of people without access to piped systems has increased and will continue to increase in the period to 2030
- Those without piped access are typically the poor who secure their water from a range of off-grid sources
- Off-grid water is typically of poor quality with high unit costs
- High unit costs and low affordability implies off-grid customers cannot access the quantities of water that their piped counterparts expect

It is therefore critical that the traditional focus on investing solely in expanding piped connections is re-examined and that practitioners start considering how ‘off-grid’ solutions could be reimagined as an acceptable way to meet the requirements of SDG 6.1. As will be seen in later sections it is expected that off-grid solutions will be at a lower capital cost compared to traditional piped solutions. Governments might therefore make more progress towards SDG 6.1 if they develop a mix of on- and off-grid solutions rather than if piped solutions alone are followed.

Figure 7: 2030 Projections of Prominently Declining Piped Access Across Developing Countries



3. Challenges of Delivering Piped Services to Urban Off-Grid Customers

3.1 Focusing on urban off-grid customers

As the previous section has shown traditional piped investments and policies, with existing finance availability, will not allow most developing countries to achieve the SDG 6.1. There is need for analysing off-grid solutions that are SDG 6.1 compliant in terms of being accessible, safe and affordable. However, the off-grid water supply services have their own challenges with a myriad of small unregulated private providers and issues of quality and affordability. It is important to better understand who these providers are and whom they serve.

For convenience the customer side is split into two groups:

- ‘bottom of the ladder’ - those who do not have any improved water at all, i.e. those directly accessing ‘surface water’ or ‘unimproved’ as per JMP Ladder (108m people); and
- ‘middle of the ladder’ - those who are getting ‘limited’ or ‘basic’ services as per JMP Ladder (568m people).

Based on the literature review, the typical urban customer at the ‘bottom of the ladder’ is someone who lives on the fringes of towns where the off-grid suppliers do not operate and who cannot afford to buy even untreated water from far away suppliers. Most of such customers are concentrated in a few countries, with 16 countries accounting for 80 percent of such customers. For such customers, mainly the poor, lack of formal land title, absence of nearby piped networks, and low affordability are the major issues that need to be addressed if they are to be moved up the ladder.

The more significant ‘off-grid middle of the ladder’ who presently have some services - limited or basic as defined by JMP ladder - have a different set of challenges. Most of them are residing in urban, and peri-urban areas of Africa, Asia and Latin America, in developing and fast urbanizing countries and a significant number of these customers (around 40percent) are from poor economic backgrounds¹². Another 10-15percent (about 50-60 million) are estimated to be non-poor residing mostly in peri-urban areas with no piped networks close by.

3.2 Challenges for scaling-up piped services to the urban off-grid customers

It is important to understand the reasons why it has not been possible to provide piped services to off-grid customers as this may provide insights into the challenges to be faced when attempting to provide SDG 6.1 compliant off-grid services. There are many reasons and not all will apply given the vastly dissimilar situations around the world. Poor utility governance with low accountability, lack of political will to reform, poor regulations and weak capacity have been some of the more critical and prevalent underlying causes. Apart from inappropriate policies, poor financial viability of the utilities arising out of high wastages, including Non-Revenue Water (NRW), and low tariffs add to the problem of service exclusion for the unserved and under-served. Ultimately there simply is not enough funding to provide universal coverage with piped supplies.

Those without piped services, be they in the core urban slum settlements or peri-urban areas, have unique and complex characteristics that make it difficult to extend piped water services to them as they grow. For example, peri-urban areas could be extensions of existing cities as people settle down in the peripheries which have cheaper real estate compared to unaffordable core areas (Jakarta, Mumbai, Manila, Nairobi for example). Very often, smaller towns near a bigger city get absorbed into the larger urban agglomeration

¹² JMP WASH database analysis.

thus becoming peri-urban area of a large city. Bangalore, Jakarta, Lagos, Lima and Buenos Aires are examples of cities which have become urban agglomerations absorbing smaller adjoining towns. In all these situations, the institutional, policy and financial challenges of urban service delivery are extremely complex. Similarly, the urban poor in the core slum or similar settlements have issues which are unique to such habitations. Places like Favela do Moinho (Sao Paulo) Orangi (Karachi), Kibera in Nairobi or Khayelitsha in Cape Town where a very large number of urban poor reside have very complex local situations not easily amenable to standard solutions. Thus, standard business models of providing piped water to all cannot be the solution.

The major challenges to moving the unserved and under-served up the ladder to ‘safely managed’ category can be broadly classified as per Table 1.

Table 1: Major challenges to provide safe piped water to urban off-grid population

Challenges to provide safely managed water supply	Aspect of Safely Managed that gets impacted
<i>Land Tenure / outside Jurisdiction Limits</i>	Results in denying access and thus service altogether, as most governments/utilities insist on excluding poor people if they cannot show ownership of land. If people live adjacent to the city but outside the city boundary they will be excluded from service delivery by the city utility.
<i>Budgetary Constraints and Inefficiencies of Utility</i>	Peri-urban areas do not get priority while extending piped networks due to limitations of budget. Even the piped connected people get limited hours of supply resulting in lower quantity due to inefficiencies of utilities
<i>Capital Costs to connect</i>	Faraway areas on the periphery of cities, or those with low population densities, do not get included while planning service extensions due to high cost to extend networks
<i>Affordability to buy water</i>	Affordability to access services and to buy water from high priced service providers excludes poor and lower middle-class people, who end up buying much smaller quantities, typically for drinking and cooking purposes only
<i>Politically light weights</i>	In several cities, the poor constitute an unimportant segment politically and thus they do not have any ‘sponsors’ to put pressure on utilities to include them in services

Unfortunately, city planners in developing countries typically underestimate water needs when they prepare their long-term master plans. Peri-urban growth areas are ignored, or their scale underestimated leaving water planning to the utility who may have been left outside the original planning process and are therefore at a disadvantage in meeting those needs. In a few cases where the peri-urban areas have relatively better-off people it has been possible to develop water systems provided by private developers for small townships or colonies, for example, in Gurugram adjoining Delhi city.

These challenges can be grouped based on the nature of challenges:

- ***Institutional Challenges and Inadequate Planning:*** Often urban areas are under the management of multiple institutions with fragmented responsibilities and none solely responsible for ensuring a reasonable water service. In addition, those institutions that create water infrastructure may not be responsible for operations of the facilities or may have very low capacity. In peri-urban areas which were historically part of rural areas, the agency responsible for water supply may continue to be the original rural local body rather than the urban water utility - making it difficult to receive service from water utility. Dhaka in Bangladesh or Bangkok in Thailand have such a typical problem where peri-

urban interface can be excluded from services of Dhaka Water & Sewerage Authority (WASA) and Bangkok's Metropolitan Waterworks Authority (MWA) since they were formally not part of the urban area. In slum settlements, sometimes there are 'slum development agencies' whose jurisdiction disincentivises any other agency to provide service. Most Indian large cities (Chennai, Bangalore, Kolkata and Pune for example) have separate Slum Development Agencies who are supposed to manage the water services but lack the resources.

- ***Legislative and Regulatory Challenges:*** Unclear legal framework to provide the services with ambiguous or overlapping regulatory regime on licensing, tariffs, standards, etc. In several Latin American Countries with federal structures the number of agencies involved in setting standards and regulating water services inevitably results in uncoordinated and overlapping responsibilities. Also, implementation of regulations on desired quality may be non-existent. Examples Port-au-prince, Patna, Cochabamba.
 - ***Land Tenure/ outside Jurisdiction Limits:*** Lack of land tenures may make the slum dwellers ineligible to receive any services. This results in denying access and thus service altogether, as most governments / utilities insist on excluding poor people if they cannot show ownership of land. Also, if people live adjacent to the city but outside the city boundary they may be excluded from service delivery by the city utility. Some examples are Hyderabad, Accra, Jakarta.
- ***Financial and Budgetary Constraints:*** Peri-urban areas may not get priority for piped networks due to limitations of the budget. In addition, even the piped connected people may get limited hours of supply resulting in lower quantity due to inefficiencies of the utilities.
 - ***Capital cost challenges:*** Unit capital costs are usually higher in the peri-urban areas due to the need for expensive infrastructure investments coupled with lower population density. In slum settlements access difficulties may demand more last mile distribution investments. In Port-au-Prince in Haiti, the fringe areas of town are not only at a distance but also at a height thus making unit costs expensive and low priority for a financially constrained utility.
 - ***Customer base may not be financially attractive.*** The socio-economic profile of peri-urban residents is invariably lower than the urban core whilst slum dwellers are usually much poorer than the rest of residents. This implies revenues are likely to be constrained by affordability issues, especially compared to the likely higher capital costs of providing service – making them less attractive compared to other unserved customers. Also, the customer base may not be stable enough due to uncertainties of land tenures and/or migratory nature of some of the customers.
 - ***Affordability could be low:*** Affordability to access services and buy water from high priced service providers excludes poor and lower middle-class people, who end up buying much smaller quantities, typically for drinking and cooking purposes only and ending up consuming much lower than necessary quantities. Customers could be under-served by the Utility because some of them may be 'poor' customers who *cannot afford initial connection costs or prices charged*; and they *may not be politically significant* (example, Accra, Maputo).
- ***Quality and Reliability of Water Source:*** Quality and reliability of sources may also be an issue in peri-urban and fringe areas compared to established core city areas. For example, Chennai in India has saline intrusion issues in peri-urban making it unhealthy to use untreated water. Bangladesh cities have

arsenic contamination near their cities which requires expensive treatment or looking for alternate faraway surface water sources.

A recent World Bank report (2017)¹³ notes that...” *Where there is a desire to extend formal service provision to informal settlements, peri-urban areas and slums, the service providers may face several levels of constraints. In many cases they simply do not have the legal mandate or will, to provide services in unplanned settlements as this could require them to assume risks associated with: (i) the lack of household security of tenure (e.g. possible eviction and lack of documentation); (ii) technical challenges related to transmission distance, distribution in unplanned, densely settled areas, and hazardous terrain; (iii) collecting bills from low-income customers with unsteady income streams; and (iv) engaging in areas where worker safety is compromised*”.

¹³ Bridging the Gap-Service Delivery Considerations for Rapidly Urbanizing Settlements, World Bank, 2017(unpublished).

4. Existing Institutional Arrangements for Urban Off-Grid Services

The previous section highlights many of the challenges likely to be faced by any provider when considering expansion or improvement of services to the currently non-piped population. Despite these challenges there is still an active private sector providing off-grid services, albeit not at the scale, quality, quantity or prices that would lead to SDG 6.1 compliance. However, an improved understanding of how the off-grid sector currently works will help provide insights into how they have managed to build businesses and what changes would be needed going forward towards SDG 6.1 compliant off-grid services.

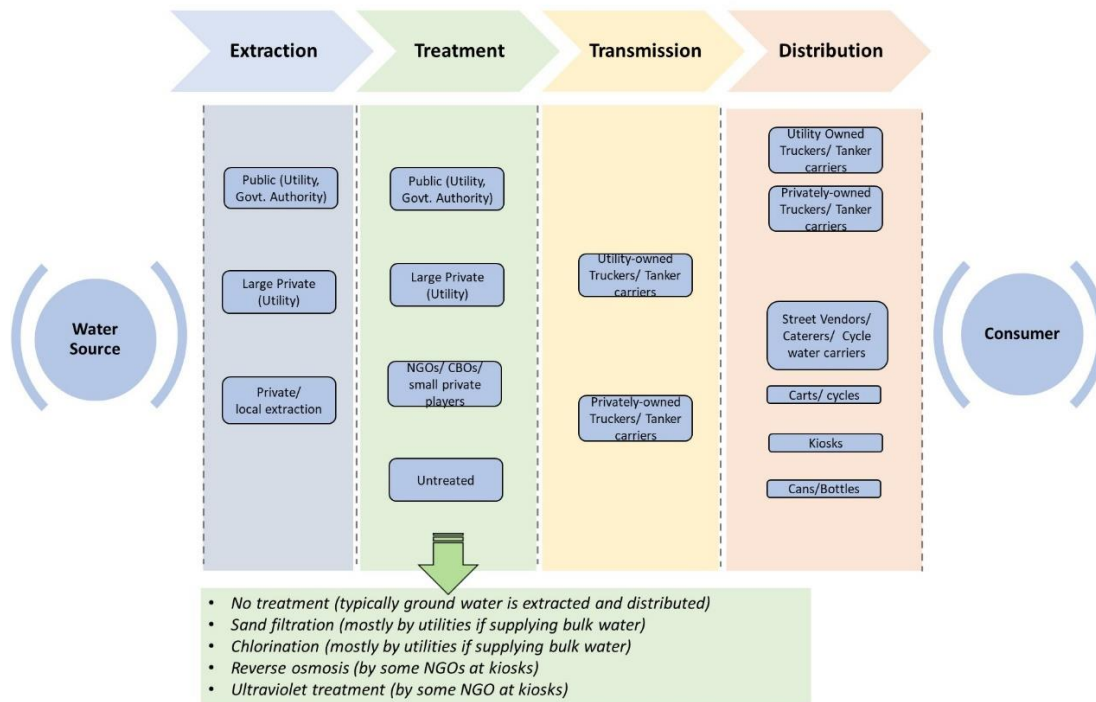
4.1 A wide spectrum of institutional arrangements and services prevail

The arrangements for the provision of off-grid water services cover a wide spectrum from one neighbour selling to another, through local and internationally supported NGOs and small private providers, to substantial private providers who not only distribute water to the end-user but also have their own committed source arrangements. While each region may have its own variation of these arrangements, what is interesting is the extremely limited role played by formal public or private utilities in any of the off-grid arrangements. Most Governments, cities and water utilities do not specifically formulate plans to service the off-grid, primarily the urban poor and the peri-urban residents. There are exceptions wherein a city has seriously attempted to target the services to the poor and unconnected. An example from Kampala, Uganda shows that when the water utility puts in place a framework and commitment, it can lead to a very positive impact¹⁴. The Bolivian Government is currently implementing a program, with assistance from GIZ, Germany, to develop the country's political and legal framework to improve water services in peri-urban areas. Similarly, although only in a limited few instances, private utilities have partnered with governments through PPP arrangements and specifically covered both network and off-grid customers (e.g. by hiring services of private truckers to distribute water). Overall, however, these proactive initiatives constitute an insignificant proportion of the total market, for example, in Nairobi, Durban (public utilities) and in Manila (private utility).

The level of service provided to the off-grid users also varies widely - from very good service (particularly by NGOs) to very poor service particularly where there are unregulated private vendors, water shortages and inefficient public services. Variation in service could be in quality (for example, highly treated to drinking water standards by global NGOs to completely untreated by unregulated private truckers), quantity (limited quantity rationed to users to unlimited amounts) and affordability (highly priced drinking water to much more reasonable priced neighbourhood supplies). In many cities, poor residents buy limited quantities of water from private players for drinking and cooking and depend on untreated water from nearby streams and rivers for other purposes. Whilst such a coping strategy is inevitable it is not consistent with the SDG 6.1 compliant concept of providing access to a basic quantity of safely managed water. Figure 8 presents a simple picture of the institutions involved in the full value chain, a variety of distribution mechanisms used, and the range of treatment technologies used in the off-grid market. In practice operators often use multiple mechanisms and multiple technologies. These are described in more detail in Annex 4.

¹⁴ See Box 2 on Kampala case Study

Figure 8: Institutions, Distribution Mechanisms and Treatment Technologies in Off-grid Water Market



There is no direct relation between the role played by government and quality of service received by off-grid customers. Durban is an example of ‘high government role - small off-grid market - high quality of service’, while Port-au-Prince is at the other extreme of ‘low government role - high off-grid market - poor quality of service’. Thus, while off-grid has often filled the gap left by the public utilities, the quality of water, the unaffordable high price and poor reliability of their services leaves much to be desired. Only in a few cities, the private tankers are ‘licensed’ to operate as water carriers/resellers by the public authorities but without any real monitoring of the quality of water or service examples Chennai, Abidjan, Nairobi, Port-au-prince. Based on data available, Figure 9 shows the general extent of coverage of public/private off-grid service providers in various cities mapped against the level of service.

Figure 9: Public/private Off-grid Service Providers in various Cities

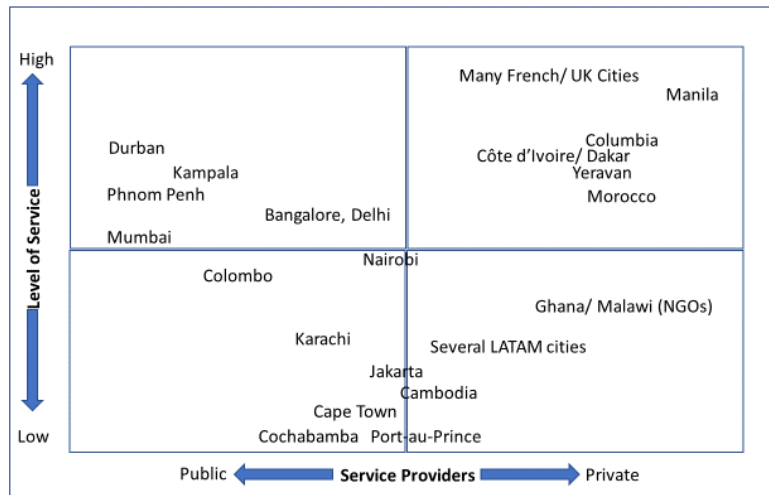
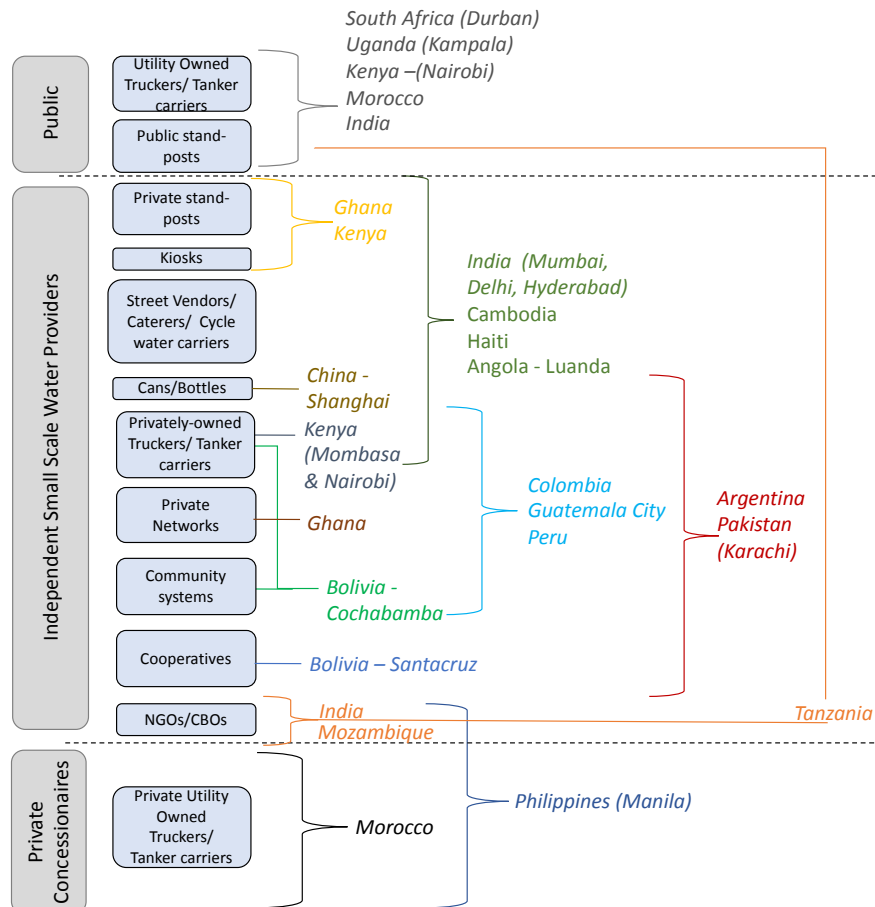


Figure 10 attempts to map various countries/cities with such off-grid service providers, and the case studies of some are provided in the following section and Annex 4.

Figure 10: Cities mapped with respect to Off-grid Service Providers for Urban Areas



4.2 Traditional Utilities and the urban off-grid market

a) Public Utilities

Notwithstanding well-established water policies, institutions and trained staff, the governments and public utilities have typically not played a major role in serving the off-grid people – practicing a “laissez faire” attitude. They have always considered serving people with “piped water” as their goal. Since they are struggling to do even that it is not surprising that they have ignored the off-grid customer. Even while having policies to expand coverage and improve the service, most governments, cities and water utilities do not specifically formulate detailed operation level plans to service the under-served or the unserved and rarely measure or monitor services to those not connected to the pipe network.

Where public utilities have ignored the needs of off-grid users, small private players have often taken over. In the absence of any accountability for quality of water, constraints on extraction of ground water, or on setting prices, the off-grid water market can be chaotic. This results in poor quality water, low levels of consumption, and generally high unit prices compared to subsidized utility water. The case of Port-au-Prince in Haiti (Annex 7) is a vivid example of such private participation.

Box 1: Port-au-Prince, Haiti is a prime example of when no one is accountable

The “Metropolitan Area” of Port-au-Prince (RMPP) has an estimated 2,620,000 people. The expansion area of the city has led to an estimated 300,000 people settled informally. The public utility for Port-au-Prince (CAMEP, today called “Centre Technique d’Exploitation de la RMPP”, or CTE RMPP) produces 1,600MLD but covers only half of the city. The network is very old with huge water losses (estimated 50percent). The coverage of distribution pipes is low, representing 45,000 connections in 2011. About 55000 illegal connections was reported in 2018. The price per m3 is 0.25 USD. 67percent of inhabitants rely on private suppliers for water either for drinking, domestic purposes, or both. Water service is actually operated by 2 or 3 businesses (one for production, one for transport, one for distribution). Water service is delivered through:

- *Public standpipes* (in slums only, 0.31 to 0.95 US\$/m3, uncertain quality). The utility supplies water to one cistern managed by a local committee. The committee then resells water to slum dwellers per bucket through public standpipes. In 2012 it supplied water to 800,000 people in 50 slums, however, it suffered from the quake and it now covers only a fraction of the population needs in slum areas.
- *Neighbour resale* (4 to 8 US\$/m3, low water quality). Most water resellers buy bulk raw water from freelance truck drivers (1400 of them are active in the city), who buy from borehole operators. There are around 12,500 tanks used for neighbour resale. More than 10,000 households use it as their main source for drinking water.
- *Private kiosks* (29.1 US\$/m3, good quality): Around 2000 private kiosks in the city are operated by independent resellers who buy treated water from borehole operating companies and fill user’s buckets or sell per returnable plastic containers. 4 companies (out of more than 100) provide water to 80percent of these kiosks. The booming of private kiosks happened after 2010 and the cholera outbreak, as most inhabitants feared that water from CTE or raw borehole water would be infected. In 2012, at least 300,000 people used this solution as a main source. Now it has certainly more than doubled.
- *Bottled water* (52 to 104 US\$/m3, good to uncertain quality): Around 50 bagged water producers, with three companies represent 75percent of the market. They all use water from boreholes. The distribution is made through around 6000 streets resellers and 300 shops.

The public authorities appear unable to effectively manage the private sector, with consequences for resource protection as there is no active regulation system for borehole operating companies. The Ministry of Environment (MDE) is formally responsible for groundwater control and preservation since 2006, and therefore to grant drilling and water abstraction permits. But in practice this system is inactive as the MDE has no capacity to enforce regulation.

In a very limited number of cities (Delhi, Nairobi, Kampala) the public utilities have attempted to supply water to the off-grid through arranging for water tankers in the slums. An example from Kampala, Uganda shows that when the water utility puts in place a framework and commitment, it can lead to a very positive impact.

Box 2: Success of Pro-Poor Policy Driven Water Service Improvement in Kampala, Uganda

In 2006, the Govt. of Uganda updated its 2014 Policy and said it would target 100percent coverage for water supply in Kampala City by 2015. National water Service Company (NWSC) set up an Pro-Poor Unit and implemented the “Affordable Connection Policy” by lowering the cost of connection fee to 50percent for anyone living close to mains (50 mts), implemented a “Pro-poor tariff policy” with a differentiated tariff structure and rolled out a “pro-poor targeting project” to subsidize water supply connections in poor settlements. A 2014 WBG Case Study Paper notes that... “ *On the whole, the pro-poor policy and program have led to a rapid expansion of services to poor households. Specifically, 2,405 new yard taps and 663 PWP’s serving an estimated 81,000 people were realized.*” (Source: Mukami Kariuki et al, World Bank 2014).

Again, there are also examples, though very limited, of public utility focusing on not just high coverage but also better services. For example, the eThekweni Water & Sanitation Department (EWS) in Durban, South Africa, is an example of public utility providing water in an inclusive manner. EWS focuses on understanding the customer thoroughly and practices a systematic “moving up the ladder” approach. EWS offers basic minimum water as free or subsidized water to the targeted needy while ensuring that those who consume more and who can afford to pay are charged more but incentivised to conserve and receive improving levels of service (Annex 6).

Box 3: Inclusive water supply by public utility in City of Durban

Overview: eThekweni Metropolitan Municipality (EMM) is home to Durban in South Africa. EWS- eThekweni Municipality Water and Sanitation providing water and sanitation services, sources 98percent of its water, treated, from the regional bulk supplier, Umgeni Water. In 2017, EWS supplied on average 817 Ml of water per day through over 14 000 km of water mains and 550 000 registered water connections.

Approach: Access to water is near universal (about 97percent), mostly continuous, and safe and pleasant to drink from the tap - even if it is not necessarily piped to the premises. 74percent of the population has an authorised piped water connection on the premises. Key features of its approach are:

- A strong emphasis on trying to understand its customers’ needs, and developing a range of measures and service options to support affordability
- EWS aligns the level of water services with the feasible sanitation technology, and offers differentiated service levels:
- All water supplied from public water points is provided free, and low-income households – identified by using the rates value of their property as a proxy – receive 6 kls water free each month.

Private providers: National sector legislation discourages the use of private providers. Nonetheless there is evidence of informal private sellers in other South African municipalities, including those adjacent to eThekweni, and informal private provision is growing nationally. It seems most are selling potable water sourced from the municipal supply, at a rate below the local municipal water tariff.

EWS provides supplementary tankering at no cost to customers in some areas to safeguard an adequate supply of water to all. Over half the population receives 6 kls of water free per household per month as a matter of policy, with some receiving considerably more for free through unauthorised connections.

b) Private Utilities

Public Private Partnerships has also not focused on improving services to the off-grid users. Most of these partnerships have primarily sought access to financing, the creation/extension of piped assets, improving efficiencies and financial performance, and reducing non-revenue water. No specific terms are included in the long-term contracts to obligate or incentivize the private player to achieve improved water

service for the off-grid users. Additionally, neither the transaction advisers who design the contracts, nor the public utility staff who negotiate the contracts, are sensitive to clearly identifying or defining the relevant off-grid service parameters. As a result, they do not give adequate flexibility in the contracts for the private operators to innovate the service delivery models to reach the off-grid. There have been some exceptions such as in Manila wherein the private operators have innovatively made a difference in expanding services to the poor and the periphery areas.

Box 4: A case of Manila, Philippines for Private Utility Partners with Community

Manila city water services were handed over to two private companies in 1997 in what is considered now a successful privatization. Manila water Company that operates the east zone (1400 sq kms; 6.1 million people) has an inclusive business model- “Tubig Para Sa Barangay”- or water for poor communities. TPSB forms partnerships with local government units (LGUs) and community-based organizations (CBOs) through formal MoAs, taking on responsibility to build and provide infrastructure but letting the communities determine their own level of participation, contributions, meter management and self-monitoring. High community ownership helps in reducing pilferages, better upkeep, lowering of costs and a responsive service delivery and quality of water.

What is clear from these examples is that utilities and governments have always looked at their role as “expanding the piped network” rather than “service provision to all”. Non-piped areas are therefore left to fend for themselves until piped services can be provided – rather than being serviced by better organized, financed, and regulated off-grid providers who would deliver a much better and affordable service than would otherwise be provided.

4.3 Off-grid informal small service providers play an important role

In the absence of adequate service provision by traditional utilities the local private service providers have sprung up to start a business of providing water to off-grid customers in Argentina, Bolivia, India, Cambodia, Ghana, Kenya, Mozambique for example. While most of these are stand-alone businesses, there are a few instances of private providers sourcing water from utilities and distributing it to the unserved. Obviously, these arrangements are more prevalent where there is a significant urban population that is unserved (without network access) or under-served (with access but poor services or quality). However, there are instances where private providers working with utilities are not too happy about working arrangements. A PPIAF Report quotes that” *In both Kenya and Bangladesh, most point source operators resell water purchased in bulk from public utilities. At least one-third of providers in both countries cited problems in their relationship with the utilities with respect to pricing, reliability of supply, or extortion*”. In some cases, such as in Accra, off-grid suppliers receive bulk water at high prices from the utility making their businesses less attractive. *In Accra although reselling is formally illegal, many households that resell have been put on a commercial tariff, effectively acknowledging current practice*¹⁵

Perhaps because of their small scale and informality (and hence poor data reporting), not much systematic research and analysis of their geographical extent, challenges, successes or failures has been carried out by academicians or practitioners. However, there are plenty of examples from the field in Africa, Latin America and South and South East Asia about their role, challenges and results of their work. In addition, in a small way there are local NGOs that have become active in providing water to the urban poor,

¹⁵ Marianne Kjellen and Gordon McGranahan, 2006, IIED, UK

particularly focusing on drinking water after treating the water sourced from nearby ground or surface sources¹⁶.

Box 5: Profile of Small Private Service Providers Market in Kenya

A Private Tap Water Vendor or a Kiosk Vendor is typically a woman, operating 6 days a week with fixed operating hours; typically, users collect the water themselves in a 20-litre jerry can for around 3 Kshs. In the study conducted, they sold over 235 cans a day (Kiosk) or about 94 (Tap water Vendors). A Kiosk vendor earned about US\$ 2.4 a day (more than what they could earn from many other activities. A large portion of Tap and kiosk Vendors (62 percent) had a legal connection to the utility.

A CBO supported/operated Kiosk is typically run by a group of residents grant funded/ subsidized by an NGO. They also sell 20 litre cans but charge a subsidized rate of Kshs 2 per 20L Jerrycan.

Borehole Water Vendors are typical family run businesses who supply to neighbours but mainly to tankers and pushcart vendors. Though they are licensed (to dig boreholes) quality of water is not monitored and is poor with no treatment. They charge around 6 Kshs but much higher prices during high demand times exploiting the shortage situations.

Pushcart vendors who source water mainly from borehole vendors deliver water to informal and Peri-urban settlements manually or donkey pulled carts at their houses. They tend to operate where Kiosks or Tankers are not active. They charge a high rate of around 12 Kshs/20L for home delivery Tanker trucks are privately operated bulk suppliers, source water from either utility or boreholes and supply bulk water to those who can store water at around 8 Kshs.

(Source: Small Scale Water Providers in Kenya, UNDP 2011)

These small private sector service providers operate as for-profit enterprises looking at water as one more business in their portfolio. Though there is inadequate research into understanding the people behind these operators, the available research suggests that: (a) they are usually local operators (b) the businesses are small in scale (c) they operate asset-light businesses with minimal investments and (d) they are risk takers taking the regulatory, payment, water source and business disruption risks. In Latin America, in Buenos Aires, Cochabamba, Bogota, Lima and many other cities private players dominate off-grid markets.

Box 6: Private players are key in many cities in Latin America

Independent providers in Latin America run a wide range of product and service lines, of ownership patterns and of size. An individual with a push cart, selling water by the glass, bag, or gallon, can reach between one and two hundred people daily; a trucker who carries water house to house can generally serve between 70 and 350 households, or between 400 and 1500 people each day. The more complex providers operate network systems that generally serve anywhere from a hundred to several thousand households on a sustained basis, although such companies were found starting up with as few as 10 customers. The average independent network in Asuncion counts about 1,000 customers.

Some independent providers distribute utility produced water, but others get water from private sources, usually on the city's outskirts. Private water producers with deep wells, dams, and sometimes treatment plants both sell to secondary distributors and maintain private networks and, in some cases, run their own distribution companies. In Lima, where the law forbids private water production within the municipal perimeter, over 60 private wells on the city limits provide water to the independent tank truckers-and to Lima's official water company too when official sources run dry.

(Source: Extracted from "Independent Water Entrepreneurs in Latin America, World Bank, April 2003)

Scale is an issue for the sustainability of these small service providers. They seem to serve a small number of households- from as little as 50 or so to a high of no more than 3000 households. According to a 2005 World Bank Report¹⁷... " *In Latin America and the Caribbean, where urban coverage is high, SPSPs more frequently take the form of piped water systems, mainly Peri-urban, small town and rural; in South Asia, SPSPs seem to focus on gap-filling activities with many tankers operating in various cities.* " Often, they are the main service providers as the users are not connected to piped networks of the utilities and do not

¹⁶ See Annex 4 for a Detailed Note on Private and NGO Service Providers, their market share, and examples of successes and failures.

¹⁷ The World Bank, 2005, Mukami Kariuki et. al.

have any off-grid service from the local utilities. According to another PPIAF/ World Bank Report¹⁸ sales by these providers ranged from a very low 5KL per month in Cambodia (with household clients) to 13KL in Kenya and 17KL in the Philippines (with non-household clients as well).

However, there are also instances of such small service providers being the aggregators/ intermediaries between the utilities and the users, particularly in cases where they source the water from the utilities. These small private providers operate broadly as off-grid providers under various types of licensing arrangements such as licensing of tankers/resellers (Nairobi, Kampala) and licensing of water extraction (Chennai) or in many cases without licensing and illegally (Cochabamba, Port-au-prince). In Maputo household water resellers and small-scale independent providers are reported to cater for as many as 21 percent of unconnected households in off-grid neighborhoods¹⁹

Box 7: International NGOs complement local water suppliers in Malawi

Water for People is a multi-country NGO that operates across 9 Countries in Latin America, Asia (India) and Africa (Malawi, Rwanda, Uganda). WfP works in over 30 Districts with 4 million urban and rural people in water and sanitation sector. Their Malawi operations started in 2000. Initially they worked on a number of small projects, but in 2006 changed their strategy to focus on three regions - 2 rural and the third in peri-urban areas of Blantyre City (a city of 730,000 population with 70percent living in informal low- cost housing). In Blantyre, WfP works with all stakeholders- the Blantyre water Board and the City Assembly, the civil society and the private sector. Its theme of “Everyone Forever” underlies its efforts to support Water user association to manage water kiosks. WfP supports the Water User Associations (WUAs) in managerial, financial, technical and human resource aspects. Since the start of the program, WfP has set up 10 WUAs in Blantyre. (Source: Water for People website and documents)

There have also been instances of international water NGOs who work with local NGOs/Private service providers to bridge the gap though the scale of such operations is invariably limited. WSUP, WaterAid and Safewater Network are just a few examples of such international organizations that collaborate actively with local NGOs. All of them keep their costs low and many have received grants or support from philanthropic organizations and sometimes from investors. Invariably, they all work actively in educating their users on safe water-health linkages and engage with the user communities extensively. All of them have designated point of sales for distributing water and some of them adopt home deliveries also. Annex 4 provides the profiles of a few select NGOs active in water services in developing countries.

In summary, public utilities and the local governments play almost no role in providing or supporting services to the off-grid urban residents, whether these are the poor in core urban slum-like settlements or the non-poor peri-urban residents. The number of incidences of public sector playing any significant role in off-grid water services is minimal. While the share of each of the urban water service providers (public utilities, NGOs, private players-small and big) is difficult to estimate globally and their business models are too varied to summarize, one can note that about 550-560 million people are getting serviced by small Private Service Providers and another 10 million by NGOs²⁰. Sub-Saharan Africa, South Asia and South East Asia account for the bulk of these customers.

¹⁸ PPIAF and The World Bank, 2009, Editor Judy L. Baker.

¹⁹ Physics and Chemistry of the Earth, 2008

²⁰ Estimates reported on websites of large global NGOs. See, for example, Water For People, <https://www.waterforpeople.org/>; Safe Water Network, <https://www.safewaternetwork.org/>; Piramal Sarvajal, <http://www.sarvajal.com/>; 1001fontaines, <https://www.1001fontaines.com/en/>; Jibu Rwanda, <https://jibuco.com/rw/>; dloHaiti, <https://dlohaiti.com/>; SOPAR-BalaVikasa, <http://www.sopar-balavikasa.org/>; and <http://www.naandi.org/naandi-community-water-services-ltd/>.

5. Urban Off-Grid Solutions for Moving Up the Ladder to Safely Managed Services

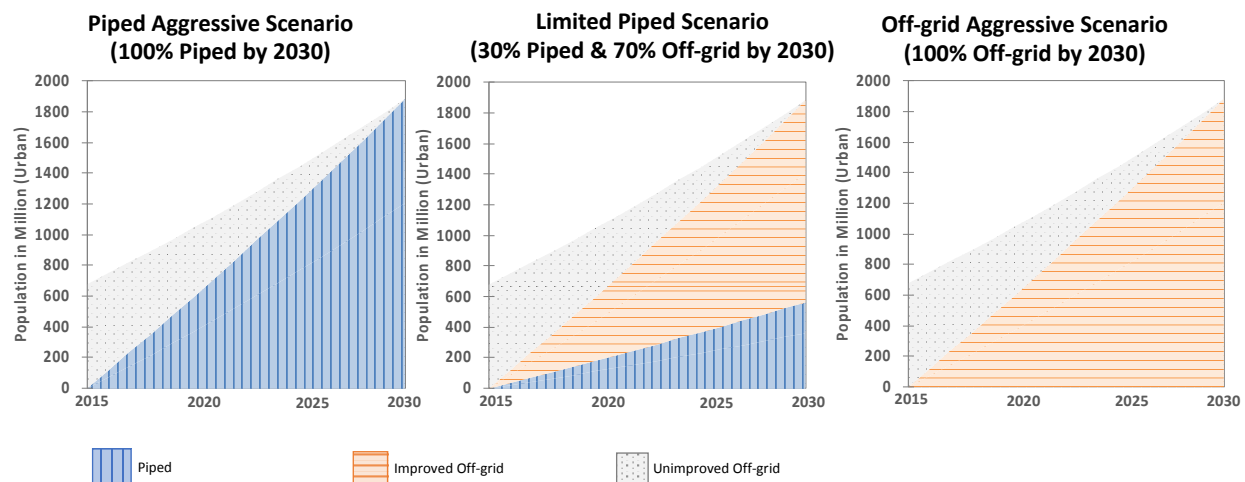
5.1 Strategic approaches

Achieving SDG 6.1 compliance would involve moving up the ladder to ensure access to sufficient quantity and safe quality of water, available when needed and at an affordable price. Having understood that piped solutions alone will not reach us to these goals and that off-grid solutions are an important element of the strategy to achieve SDG compliance, there is need to consider different strategic options and the policy and institutional implications of each of the options to arrive at a pragmatic approach.

Although off-grid solutions are part of a city water supply mix of service delivery, their role has not been considered by planners and city managers. However, if the off-grid sector can be reimagined to be SDG 6.1 compliant then off-grid options could play an important role in ‘moving up the ladder to safely managed services’. Three key strategic scenarios to achieve the SDG goals have been analysed as shown in Figure 11²¹ below. These constitute:

- *Piped Aggressive Scenario*, which assumes that all customers in urban areas are given piped access to safely managed water through a “mission mode” approach which rapidly increases the piped coverage rate with a high level of investment.
- *Limited Piped Scenario*, which assumes that some percentage of the currently non-served population in urban areas are given piped access to safely managed water while the remainder are covered by safely managed off-grid solutions.
- *Off-grid Aggressive Scenario*, wherein all existing non-piped customers in urban areas and incremental urban population are given safely managed water via improved (reimagined) off-grid services.

Figure 11: Strategic Scenarios for meeting SDG 6.1



²¹ Unimproved off-grid in the chart above refers to a decreasing set of people who are steadily given either piped connections (left chart) or improved off-grid services (right chart) or both (middle chart)

Note that ‘business as usual’ is not an option to achieve the SDG 6.1 by 2030 - as off-grid customers would not be SDG 6.1 compliant in terms of quantity, quality or affordability. It is only by taking steps to actively improve off-grid supplies that they could help in meeting the SDG 6.1 requirements.

5.2 Analysis of Scenarios

Each of these scenarios²² have their advantages and challenges and the strategy may not be the same for all countries.

The “Piped Aggressive scenario” is what most utilities may desire as they have always believed that their goal is keep expanding the piped network. It is their view that when people get piped access then naturally their service levels go up. Unfortunately, the experience on the ground does not support this position. As already emphasized, simply trying to extend the connections does not necessarily lead to improved services on the ground. Such an option also ignores the opportunities to leverage the existing private/NGO off-grid initiatives and markets which could help bridge the SDG gap. In summary this option:

- is hugely expensive and therefore rarely get executed due to shortage of funds,
- is generally inefficiently and incompletely implemented due to poor capacity to plan/design/execute,
- has huge inbuilt delays possibly due to extraneous factors such as non-availability of required land, slow approval processes, poor quality contractors, and hence
- often results in poor services to the customer with intermittent supplies and low quality of water that don’t meet SDG6.1.

Thinking differently and going for a “Limited piped Scenario”, the option blends the ongoing utility plans to provide piped access to a portion of unconnected customers and leverages the existing informal private and NGO off-grid providers to service the remainder. By improving (reimagining) the services provided by these actors the off-grid users, particularly the poor and the peri-urban, could move up the ladder to receive safely managed water.

Lastly, an “off-grid aggressive Scenario” is considered to depict the situation wherein all unconnected customers are provided access to safely managed water via off-grid arrangements. This might be achieved, for example, by having the utilities keep control of the extraction, treatment, transmission, storage and the existing piped networks – but let off-grid providers manage distribution of water to the unconnected.

Given that the “piped aggressive scenario” is unlikely to be affordable in most countries then the optimal mix of on-grid and off-grid supplies should be assessed based on budgetary limits of the government / cities as well as the affordability of the customers. A mixed approach that brings off-grid solutions into the mix is the more practical and doable strategy and would allow less investment to provide safely managed water to all customers by 2030. Further, partnering with private sector in a complimentary role with the public sector would add to the capacity to scale up the services.

To facilitate a larger role for off-grid service provision governments will need to consider at least the following:

- Policy implications

²² In all three scenarios, the existing piped network is assumed to perform well without any additional investment requirements and hence no rehabilitation of the existing network is assumed.

- Institutional arrangements for service provision and oversight
- Service quality – quality, quantity and availability
- Affordability

5.3 Policy and Institutional Implications

To establish off-grid distributors as a regulated and dependable segment, it would entail “enhancing the performance of off-grid sector” by recognizing the role played by private providers and then building their capacity to perform better in the distribution space. Since the private players prefer asset-light strategies, partly as a result of regulatory uncertainty and lack of finance, and have been active in the off-grid distribution space, governments can recognize their roles and encourage them to complement public utilities. But without adequate policy and regulatory certainty, the private providers are unlikely to scale up and will perhaps remain fringe players. Hence any scenarios which places emphasis on off-grid delivery arrangements would include reforms on policy and regulatory aspects. There will be a need to rewrite water policies to make them focus on “service provision” rather than “piped service delivery”. The exact roles need to be more clearly defined keeping in mind what the private sector is good at and is willing to shoulder (e.g. in terms of its own risk-taking ability, capacity, access to finance). The aim would be to facilitate the growth of an SDG6.1 compliant off-grid service market.

Paradoxically, the piped customer’s tariffs range from 0.5% to 3% of household incomes, taking the incomes of the poorest, whereas the off-grid tariffs are much higher at 5 to 25% (see Table 7). This is mainly because, currently customers with a piped supply receive a highly subsidized service – whether through capital subsidies provided when the systems are built, or through operational subsidies when systems are operated and unable to recover costs through user tariffs. Those customers securing services from off-grid providers receive a zero-subsidized service – the providers have to cover all their capital and operating costs from the tariff charged to customers. The result is that the cost/m³ of off-grid water is several times that of the cost/m³ of piped supplies.

Thus, for the same “affordable” monthly bill the result is low levels of consumption in the off-grid household and a higher level of consumption for the piped household. In other words, if a basic level of consumption is assumed for all households, the cost to the off-grid consumer would be prohibitively expensive, whilst that of the piped household would be significantly less and affordable in almost all cases, assuming technology remains the same. Addressing issues of affordability therefore requires a fundamental review of the financing of the sector and the allocation of subsidies between piped and off-grid services. This is discussed further in Section 7.

Well capacitated regulatory and monitoring institutions should be put in place to focus on services from off-grid private service providers and public utilities should play a complimentary role. The exact role of public utility vis a vis the off-grid providers can further be explored (see Section 6 for detailed discussion) but governments and utilities will have to accept that their roles change significantly.

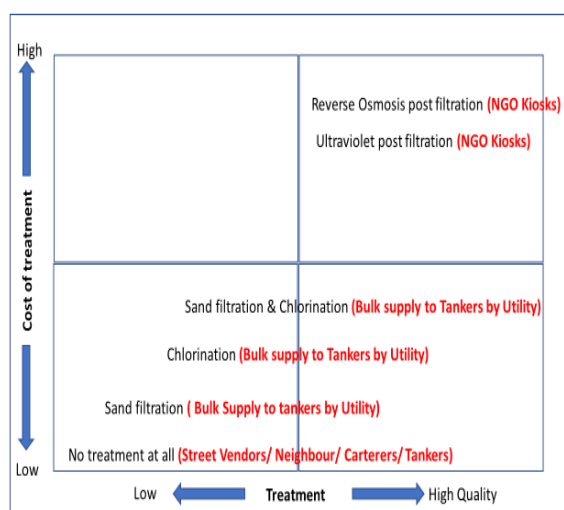
While designing the institutional arrangements, experience from the ground should be considered. There are good examples of oversight of off-grid by the public utilities (Kampala, Nairobi), formal arrangements between utility and off-grid providers (Manila, Delhi) and unacceptable complete disassociation by the utility in off-grid services (Port-au-prince).

5.4 Service Quality

Quality of water is a big issue in the off-grid market in several cities in developing countries when it is untreated or partially treated. There is no guarantee that water is of acceptable quality when it comes in the pipes, particularly intermittently, but public utilities can be at least held accountable for poor quality, unlike in off-grid market. For example, in surveys done in urban Bangladesh, it has been seen that water in only about 36percent of the households meet local quality standards (E-Coli contamination and Arsenic concentration)²³. In urban Sierra Leone, 87.7 percent of the households were accessing water with E-Coli in source water²⁴.

Overall, ground water is the major source of water (over 80 percent) for the private service providers who are having their own sources. Only a limited proportion of private players, perhaps less than 10percent, use surface water if the city happens to be near a clean river or has many lakes. Thus, a significant proportion of water supplied by small informal private players, barring those who collect, transport and distribute utility water, is untreated and unsafe.

Figure 12: Spectrum of Technologies in Off-grid Water Treatment



However, where water is sold through Kiosks, water is treated or partially treated. Typically, it has been seen that Kiosks run by local or international NGOs treat the water using Reverse Osmosis (RO) or other water purification techniques depending on water conditions, whereas Kiosks run by private informal providers either don't treat the ground water at all or source the water from local city utilities who supply treated water. Figure 12 shows how costs of treatment vary for different types of treatments used by different off-grid providers whereas Table 2 presents treatment technologies used by well-known NGO off-grid providers for different sources of water used, based on information available through web-sites of

off-grid suppliers.

In most cities where there is a thriving off-grid market, there is hardly any monitoring or regulation of quality of water and therefore the private players may treat the water only if required to make it look clean. However, where off-grid water is supplied by local or global NGOs, water is almost always treated as “health benefits” is one of their main aims and selling points.

Table 2: Technologies of Water Purification by Off-grid Players

NGO	Source of Water	Treatment
Nandi	Groundwater	RO, UV
Sarvajal	Groundwater	RO, UV
Waterpoint	Surface/Utility/Ground Water	RO, UV

²³ Based on Bangladesh MICS WASH Report

²⁴ Based on Sierra Leone Multiple Indicator Cluster Survey 2017

Bala Vikas	Groundwater	RO, UV
dloHaiti	Groundwater	RO, UV, Carbon
Safe Water	Groundwater	LMS
	Surface Water	MSSF
Jibuco	Utility Water	UF, Chlorine
Teuk Saat 1001	Utility/Ground/Surface Water	UV, MSSF,
Spring Health	Groundwater	Chlorine

RO=Reverse Osmosis; UV-Ultra Violet; UF=Ultra Filtration; MSSF=Modular Slow Sand Filtration; LMS=Low Mechanised System; Source: Dalberg, 2017.

Where water for off-grid provision is taken from the existing public or private utilities, assurance of reliability and quality would be the responsibility of the utility. Thus, it will become important that detailed interface technical codes/manuals are established to optimise the capacities, improve accountability and for better monitoring at the interface of the utility/off-grid provider.

In summary, in a reimagined off-grid model, it will be important to ensure that there are adequate water quality standards, regulations and monitoring, particularly when multiple parties are involved in the full-service delivery chain.

Quantity of water provided to, and affordable by, customers will be an important factor if there is to be an improved off-grid service arrangement which meets the SDG6.1. Off-grid provision typically results in relatively modest per capita amounts of water delivered to customers. Whilst there is almost no reliable information on water provision quantities from off-grid providers most practitioners would likely support a statement that it is low and not sufficient for daily water use at the household level. Most off-grid water, which is generally priced higher than any possible public source or unimproved nearby river/lake/well, is used by consumers first for drinking and cooking (5 to 10 lpcd) before putting it to any other limited use. In many countries, for example, in Papua New Guinea, Madagascar, Vietnam, Nepal, poor households buy just one or two 20 litre cans or buckets (15 to 20 litres typically). Ensuring sufficient water is available at the household level through off-grid provision will likely entail two complementary initiatives:

- Investment in newer or innovative technology by off-grid service providers. For example, moving away from hand pushed barrows of dirty plastic containers which physically constrain the amount of water that can be delivered to households, and instead investing in more robust solutions that allow delivery of adequate amounts of water from clean containers, and which are then stored in clean containers at the household level.
- Financing for off-grid solutions which will encourage the above investment. This may mean improved access to micro-finance, or through other mechanisms such as subsidies to off-grid providers either directly or through customers. This is discussed further in Section 7. Suffice to say that if off-grid providers received the level of subsidy given to piped providers then a very different off-grid sub-sector would appear, if the policy and regulatory environment were supportive.

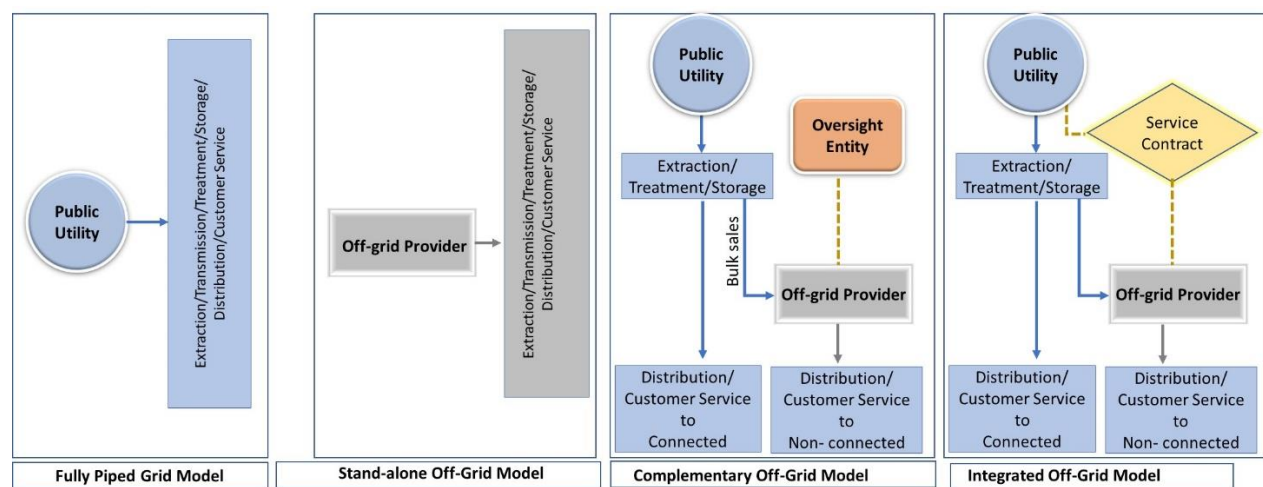
Availability of water when needed, the next element of SDG compliance, would require sufficient storage at, or close to, the household. This will be important given that off-grid water delivery is periodic, rather than continuous, as is the case for safely managed piped supplies. Ensuring availability of adequate supplies at the household level (even if there is adequate storage) is linked to the issue of delivering sufficient quantity by the service providers. As such it would require a similar enabling environment which facilitates households to invest in adequately sized and maintainable storage facilities.

6. Institutional Models for Strategic Urban Off-Grid Services

6.1 Operationalizing enhanced Off-Grid service provision

Having established off-grid solutions as an integral part of the strategy to achieve SDG 6.1 compliance, it is imperative to explore institutional models for off-grid services. Addressing the challenges associated with changing from present arrangements to the new ones along with oversight and regulations required to be put in place for the new and indeed existing players is critical. Three broad institutional models for enhancing off-grid service provision might be considered - *stand-alone, complementary off-grid, and integrated off-grid* (Figure 13).

Figure 13: Enhanced Off-grid Service Delivery Models



In the *stand-alone off-grid model*, providers would be licensed and regulated from source to tap to ensure good quality of water supply and of service. This would reflect current arrangements in many parts of many cities, but with enhanced oversight coupled with improved financial arrangements, which might allow subsidy payments to the off-grid provider to support the delivery of safely managed water in sufficient, affordable quantity.

In the *complementary off-grid* model, off-grid providers would be responsible for distribution in those areas without piped connections, and the utility would be responsible for ensuring availability of sufficient quantity and quality of water in convenient locations for the off-grid providers. This would reflect some of the arrangements in cities today in which the utility provides supplies to tankers and to local distributors. The off-grid providers would be subject to enhanced oversight by an appropriate agency (the government or independent regulator) and benefit from more balanced financing arrangements that direct some public subsidies toward them.

In the *integrated off-grid* model, the utility would enter into service contracts with the off-grid providers for the delivery of services to those without a piped connection. The off-grid activities would be a part of an integrated set of service provision arrangements for which the public utility is responsible. Again, some rebalancing of public subsidies toward the off-grid provider would be expected. This is rarely seen today—except perhaps in the case of Manila and Durban and to a limited extent in Nairobi.

The biggest advantages of this complementary option are:

- efficiencies and innovations are leveraged to enhance the capacity to serve the unserved or under-served in the off-grid market
- high amount of flexibility in the last mile connectivity and customer servicing make it possible to reach the “difficult-to-reach” poor users
- existing utilities focus on upstream activities where they have comparative advantage and demonstrated experience – releasing them from complex and difficult delivery to the final consumer
- public investment requirements go down dramatically as investments are focused on upstream infrastructure (source, treatment and transmission) and less so on the more extensive and costly distribution networks
- public investment can go further in terms of opening opportunities for enhanced, SDG 6.1 compliant off-grid service delivery and/or free up funds for subsidies
- subsidies can be much more accurately targeted to ensure improved equity and affordability to end users

6.2 Challenges associated with public-private complementarity

There are risks and challenges associated with unbundling / vertical separation and public-private complementarity. Defining the roles of each player (public/private/NGOs) clearly will be critical. Similarly, backing up the role clarity with appropriately changed policies, frameworks, guidelines, rules and a support system to roll them out will be crucial to make this model a success. In most cities/ countries today, where private players or NGOs are very active in the distribution markets, their roles are not recognized, and the legality of their operation is not clearly established. Even where they work with utilities for sourcing water, there are generally no formal arrangements.

There is need to address the challenges of public-private complementarity. Table 3 suggests ways to address these challenges.

Table 3: Addressing Institutional Challenges of Urban Off-grid Services

Institutional Challenges	Actions to address the challenges
Unclear or absence of policies/ laws	<ul style="list-style-type: none"> • Write/rewrite policies. New policies and (where required new legislation) to recognize the role of private and NGO players is required to be put in place before rolling out such a model • The role of public utilities in supporting and complementing these service providers should also be stated clearly, including supply of water for off-network distribution, technical support if applicable and types of long-term agreements that public utilities need to get into for such support.
Unclear Regulations	<ul style="list-style-type: none"> • Bring in appropriate regulations (licensing for extraction and distribution, quality of water standards, tariffs, service standards) and supporting institutions. The regulations should include a description of who can be a private service provider, who will license them and framework for licensing, and under what existing or new water quality standards do they come under. • Capacity of regulators and supporting staff needs to be enhanced. • Regulation of contract between public utility and private players (for bulk water purchase, for interface issues) is also equally important.
Multiplicity of institutions	<ul style="list-style-type: none"> • Policy to clarify roles of all agencies and remove duplicity or overlaps. • Rewrite laws to remove duplicity of jurisdiction and overlaps
Land Tenure/ outside Jurisdiction Limits	<ul style="list-style-type: none"> • Rewrite policies and laws to specifically serve those without land tenures; distribution of bulk supply water should be made possible in the peri-urban areas by policy and law

6.3 Implications for oversight and regulation of off-grid providers

Policies and regulations should have a clear objective of “enhancing water services to the poor and underserved/unserved off-grid users”. A research paper on formalization of small service providers in Mozambique²⁵, has brought this out clearly wherein the authors argue that “the predominant legal and policy framework does little to support development of improved services in areas unserved by the formal utility. Although ad hoc measures recognizing small-scale providers as a temporary alternative to service provision by a formal utility have been implemented, these measures appear designed to increase control over these providers rather than support the service delivery capacity of small-scale providers”.

If private providers are not properly regulated, particularly for quality of water, abstraction of ground water, and prices, then the off-grid water market can be a disaster. Who should regulate the private players needs to be critically examined. Public Utilities (or Government departments providing water services) cannot be the regulators as they have conflicts of interest (e.g. as bulk supplier which affects the performance off-grid providers) or they may not have capacity to monitor or regulate. Regulation of off-grid providers is rarely seen in practice other than indirect regulation in a few cities for water resources (usually ground water abstraction or in some cases permit system to transport and supply water). There is hardly any regulation that is seen for their pricing, service levels or for quality of water supplied. The case of Cochabamba in Bolivia and Port-au-Prince in Haiti (Annex 7) are examples of unregulated private participation.

Box 8: Regulating Off-grid Services - some examples

While there are many instances of off-grid water distribution by private providers, local/international NGOs and in some cases by private providers hired on a contract by public utilities, there are very few examples of properly framed and implemented regulations of such off-grid water services. Relevant examples include:

Chennai, India: Private trucks make around 700 trips to deliver an estimated 125 MLD of water, purely on a commercial basis. The trucks purchase water from the owners of agricultural bore-wells in the peri-urban areas of Chennai²⁶ and supply the water throughout the city, including to the non-residential hotels, hospitals and industries. Ground water abstraction is licensed under “Chennai Metropolitan Area Groundwater (Regulation) Amendment Act of 2002”. The Chennai Metrowater, the public utility, does not effectively monitor the Act and a fair amount of illegal over-extraction happens. Similar Groundwater Acts exist in many cities in India but the story of illegal or over-extraction is also common.

Abidjan, Cote d’Ivoire: The public utility SODECI uses the permit system to license the household water resellers so as to keep a check on the quality and service parameters. However, the system is not implemented properly and has no incentives for the resellers to take the permits with the result that most resellers are now illegal resellers.

Nairobi, Kenya: Nairobi Water Utility (Nairobi City Water & Sewerage Company) regulates tariffs for water sold by Water Kiosks and ATMs in Nairobi under its Water act, 2002. It also regulates private water tankers supplying off-grid water to slum and poor settlements through a contract based system (Bulk Sales Agreements).

Manila, Philippines: Water is distributed in Manila city through two major private water companies under long term concessions. The overall services by the two companies are regulated through the concession contracts and by MWSS Regulatory Office of the Government. Manila Water Company that operates the East Zone (serving ~ 6 million people) has an inclusive business model- “Tubig Para Sa Barangay”- or Water for Poor Communities. TPSB forms partnerships with local government units (LGUs) and community based organizations (CBOs) through

²⁵ Rhodante et al, 2013

²⁶ International Journal of Water Resources Development, L. Venkatachalam (2015)

formal MoAs, taking on responsibility to build and provide infrastructure but letting the communities determine their own level of participation, contributions, meter management and self-monitoring.

Kisumu, Kenya: Well and borehole operators dig wells or sink boreholes and sell directly to consumers and to mobile water vendors. Unlike Standpipe operators, they do not have contracts with Kisumu Water and Sewerage Company (KIWASCO) and are usually operating at a micro scale with many owners operating single or a small number of wells that they have dug on their own land (and hence selling untreated water). However, Standpipe operators operate under contract with the KIWASCO with some of them having a delegated management models with the official utility. The contract includes responsibility to extending the piped water network²⁷

According to World Urban campaign²⁸, “*the Delegated Management Model for improving access to water in urban informal settlements in Kenya has successfully improved the affordability and quality of water for slum dwellers in Kisumu while reducing losses from unaccounted-for water for the water utility company. It has created greater potential for engagement between the community and the company.*”

It is therefore critical that regulations and regulatory arrangements need to be rolled out in parallel with off-grid arrangements. An important issue to consider would be whether regulation should be through contract (between private off-grid service providers and utility) or independent regulators regulating both private off-grid providers and public bulk suppliers. Both options have significant implications on regulatory capacity needed and available, as also legislative changes required.

In addition to all the above practical challenges, the not so visible but politically important challenge will be the acceptance of the new roles by governments and public utilities. Government will be responsible to put the policies, legislation, the regulations in place and provide the required funding. The service delivery will be done by a combination of private/NGO and public utility with public utility acting as a bulk supplier of water (plus distributor where it already has established a pipe network). It is not easy for governments and utilities to let go of any of their roles and huge efforts are required for transitioning to new roles. They will need to build up capacities to take on new roles.

Even if the legal, regulatory and institutional issues are not a problem in any city/ country, invariably the capacity of the public utilities to interact/partner with off-grid private or NGO sector players is a big issue. Most public utility staff are either uninterested in dealing with such players or incapable of dealing with them. Formal contracting with clear terms on quality, service, price, etc. between public utilities and the off-grid providers is rare in developing countries. There is a need, therefore, to start building capacity of public utilities to contract with off-grid providers.

²⁷ Journal of Environmental Law, March 2014, Mulugeta Ayalew, Jonathan Chenoweth, Rosalind Malcolm, Yacob Mulugetta, Lorna Grace Okotto, Stephen Pedley

²⁸ worldurbancampaign.org/delegated-management-model-improving-access-water-urban-informal-settlements-kenya

7. Financial Implications for Urban Piped and Off-Grid Services

7.1 Financing to achieve SDG 6.1

One of the biggest issues to achieve SDG 6.1 would be the financing challenge. It is important that a cost implication exercise is carried out for the strategic options, including financial implication not only to the governments but also to the end user in terms of tariffs and affordability. Costs would include both the lumpy capital costs and recurring O&M costs.

The cost to achieve the SDG WASH goals is difficult to estimate but has been attempted. A WSP report²⁹ computed the investments required to achieve the SDG Goals for water and sanitation for basic and safely managed levels of service. According to this report, US\$ 38 billion a year (US\$ 29 to US\$ 46 billion range) is required to achieve safely managed water supply goals (rural + urban in 140 countries) or a total of about US\$ 600 billion. Of this, about US\$ 24 billion a year, ranging from US\$ 19.3 to US\$ 29.2 billion, is required for urban safely managed water. For achieving the SDG WASH Goals 6.1 and 6.2, the amounts required are huge ~ US\$ 114 billion a year – several times historic financing levels. These capital costs exclude maintenance costs of all existing and newly created assets, which can also be significant.

Most of this investment will have to come from budgetary sources of the governments despite the financial stress most developing countries are facing. This is because most water utilities have poor credit worthiness and their governance structures make them unprepared or ineligible for market borrowings or private finance. Though the Official Development Finance (ODF) from various development institutions and developed country governments has increased significantly between 2003 and 2014, from US\$ 6 billion to US\$ 14 billion³⁰, it will continue to remain a small part of the overall funding. This is exacerbated by the fact that water as a sector has not received the same kind of ODA (Official Development Assistance, the concessional finance and significant part of ODF) as other sectors. Water ODA assistance has increased from US\$ 42 billion in 1994 to US\$ 140 billion in 2014, an increase of 90 percent whereas overall ODA grew by 230 percent during this period.

7.2 Potential impact of alternative service delivery models on capital investment and O&M costs for meeting SDG 6.1

Although there is lack of data on costs associated with off-grid service provision, some estimates are presented here to give an indication of how an alternative service delivery arrangement through off-grid providers might compare to traditional piped solutions. This is in line with the objective of this report which is not to be an exhaustive assessment of how the off-grid sector could be enhanced to facilitate achievement of SDG 6.1 compliant service arrangements – but more a think piece to begin a more detailed examination of how such a model could be developed. The following assumptions have been made:

- *CAPEX for adding connections through piped networks.* The cost of providing service through piped networks is taken as US \$ 265/person for the complete value chain i.e. abstraction, transmission, treatment, distribution³¹.

²⁹ WSP 2016, Guy Hutton et.al.

³⁰ World Bank 2016, Joel Kolker et.al.

³¹ Guy Hutton et al (2016) indicate that capital costs vary from less than US\$125 per capita (for example, India, Nepal, Kenya, Philippines, Uganda, Rwanda) to a very high over US\$400 (Jamaica, Jordan, Kazakhstan, Malaysia, Mexico, Morocco, Sudan, Tanzania, Venezuela) with a population weighted average of US\$265.6.

- *CAPEX for adding connection through improved off-grid.* In a conventional piped system about 70 percent of total system capex (i.e. abstraction, transmission, treatment, distribution) is associated with the piped distribution network. Therefore, 30 percent capex of the conventional piped system is assumed as the cost for bulk water infrastructure (abstraction and treatment) to produce water for off-grid usage. i.e. ~US \$ 80 (265 x 0.3). An off-grid service delivery system would still require some network to deliver water to convenient locations for offtake but perhaps just 20percent of a traditional network requiring some US \$37 (265*0.7*0.2). In addition, the investment in off-grid distribution activities (kiosks, tankers, small vehicles, etc.) provided by a traditional private sector / NGOs would require an investment of at least US\$ 7.5 per capita³², and possibly more if the off-grid providers invest in new equipment (assume another US \$7.5/capita). Thus, the total capex for this option where the public utility is the bulk supplier to off-grid private / NGO distributors will be US\$ 132 per capita.
- *OPEX for piped systems.* Per capita annual O&M cost is estimated³³ at US\$ 0.7 per KL, which translates to US\$ 25.6 per capita for extraction, transmission, treatment, and distribution at 100 lpcd consumption.
- *OPEX for improved off-grid systems.* Per capita annual O&M cost is estimated at US\$ 10.9, comprising of US\$ 3.4 for operating and managing the extraction, treatment & transmission (one third of US\$ 0.7 per KL mentioned above for an assumed 40 lpcd consumption) and US\$ 7.5 for operating and managing the off-grid distribution.

The estimated costs are presented below annualized for 15 years at 5 percent rate of interest.

Table 4: Capex and Opex for Urban Piped and Off-Grid Services

Activity		Initial capital cost	Annual O&M	Annualized Capital	Total Annual
Traditional systems	Piped	US\$ 265.6	US\$ 25.6	US\$ 25.6	US\$ 51.2
Off-grid		US\$ 132	US\$10.9	US\$ 12.7	US\$ 23.6

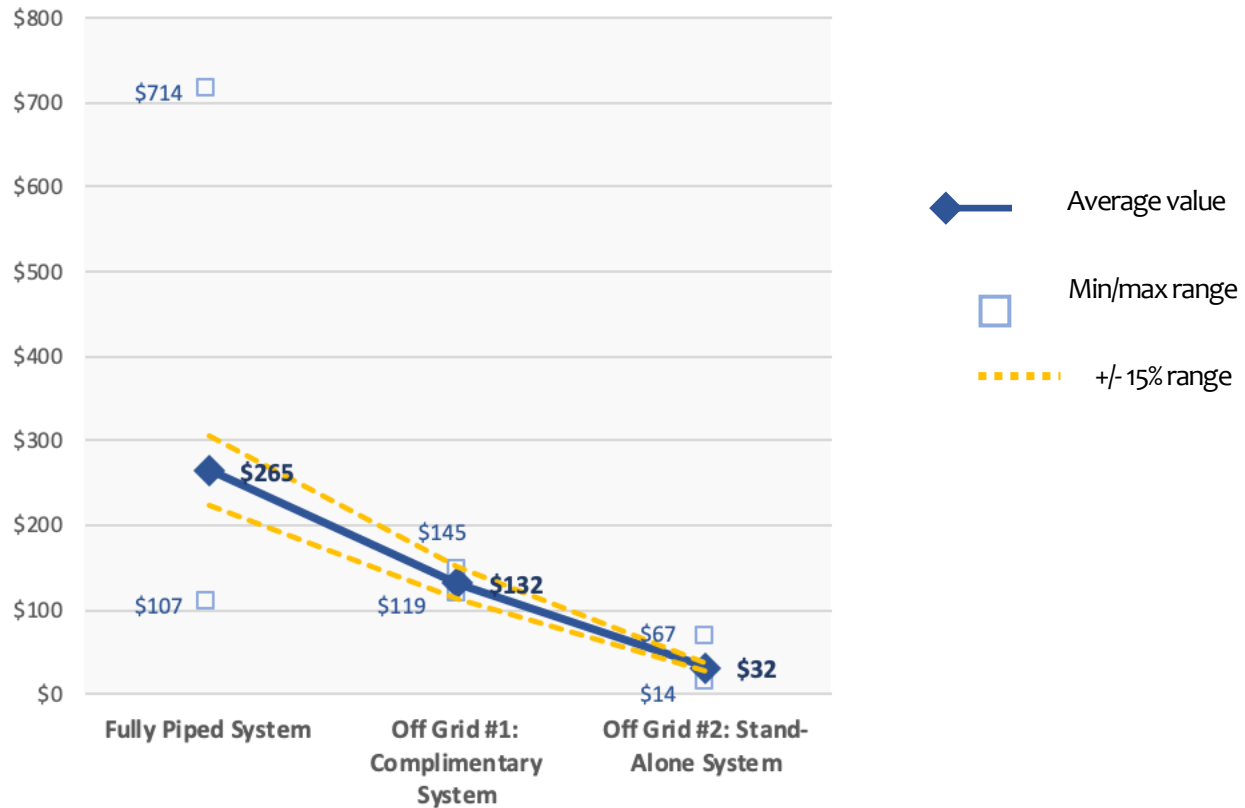
The three water service delivery models are (a) fully piped system; (b) combined piped and off-grid system; and (c) stand-alone, off-grid system. Capital expenses (capex) costs are highest for the fully piped systems (US\$265 per capita, average) and significantly lower for the stand-alone systems (US\$32 per capita, average). The combined systems are a mix of the two and have midrange capex costs (US\$132 per capita, average). Sensitivity analysis shows that even the higher range of capex costs for stand-alone systems is still 60 percent of the cost for fully piped systems. See Figure 14 and Annex 8 of this report³⁴.

³² Dalberg (2017) estimates cost of off-grid water services by NGOs at US\$ 15 per capita, split equally between capex and opex.

³³ IBNET 2014 data on median O&M costs.

³⁴ These figures are based on limited data and will need to be further refined during subsequent activities. They will depend on many factors including, for example, the extent to which piped networks are designed to provide bulk potable offtake arrangements around a city for off-grid suppliers.

Figure 14: Comparison of Water Service Delivery Models



Sources: Hutton and Varughese 2016 more than 100 data points, fully piped system; complementary); SWN India sector studies in India and Ghana (more than two data points, off-grid 2; complementary); World Bank estimates (complementary).

Note: capex = capital expenses.

Using the estimated number of 1.9 billion urban residents globally that need to be moved to SDG 6.1 compliance by 2030, the impact of different mixes of traditional versus complementary off-grid solutions is compared in Figure 15.

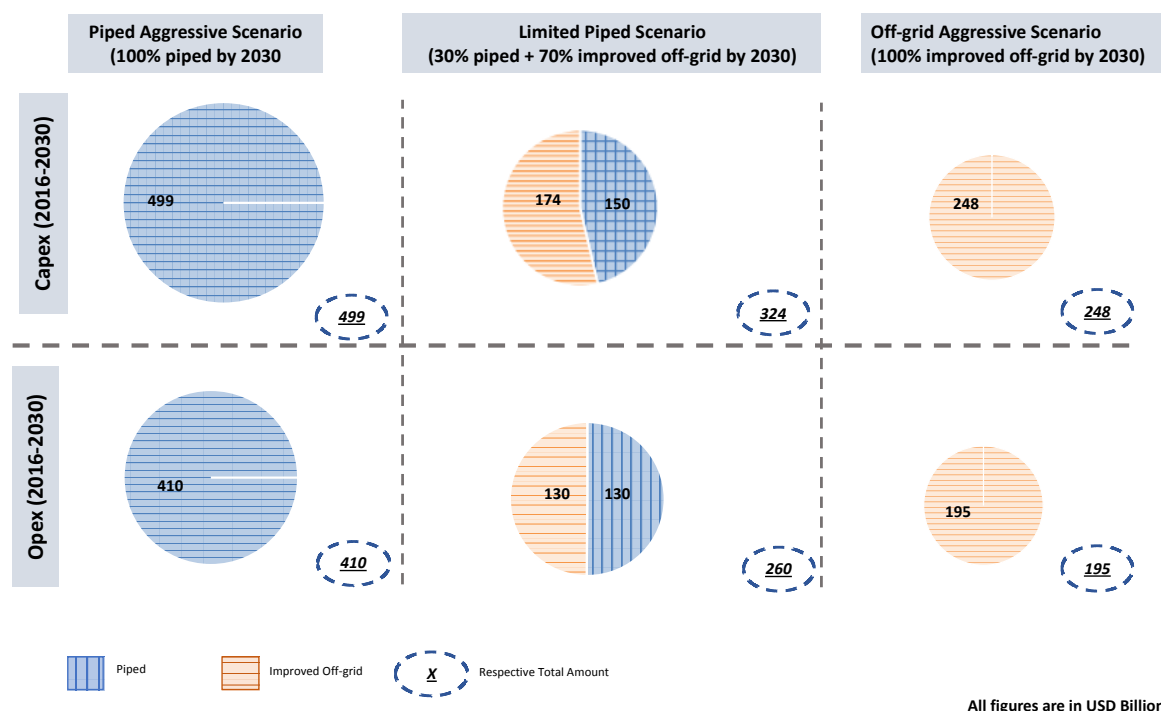
The capital cost³⁵ of providing piped network to all urban people who do not have piped access today, and the new urban population added during 2016-30, ranges from US \$ 248 billion (100% Off-grid solution) to US \$499 billion (100% Piped solution). Additionally, over the same period i.e. 2016-2030, the operational and maintenance expenses, ranging from US\$ 195 billion (in case of Off-grid Aggressive Scenario) to US\$ 410 billion (in case of Piped Aggressive Scenario) will be incurred to meet SDG 6.1.

Therefore, providing safely managed water via off-grid systems using the vertical separation model in Section 6, will almost halve the capital cost of meeting the urban water supply to meet SDG 6.1 – based on the unit cost estimations in this report. Importantly, whilst the investments in the extraction/treatment/transmission sectors would continue to be made by the public utilities in the same

³⁵ The capex and opex calculations exclude any costs required to maintain the existing piped system.

way they make today (i.e. mostly through grant or soft loan funding) the cost of downstream distribution activities might be financed by the private sector – thus further reducing the burden on the government.

Figure 15: Urban Piped and Off Grid Services Capex and Opex for SDG 6.1 (2016-2030)



7.3 Customer Tariffs – Urban Off-grid Services

What do the off-grid customers presently pay for their service? When the poor and the unserved do not get any services from the government / public utility, they do everything possible to get water for their daily needs from the private sources irrespective of the level of service, quality and indeed the price. Interestingly it is seen from several studies that the prices charged by informal players are market driven. The Dalberg report³⁶ that looked at major NGOs active in water markets for the poor noted that the prices charged vary over a wide range from country to country (from a low of US\$0.02 to a high of US\$1.48 for 20 litres). The 2005 World Bank Report that looked at private water service providers across 47 countries (Mukami et al) has noted that the prices charged by the private network operators varies from US\$ 0.17 to US\$ 0.86 per M3 of water but however, prices charged by private mobile water providers (tankers and carters) were much larger from US\$ 0.17 to US\$ 11 per M3. The median price of vended water per liter is generally 10 times the price charged for piped water based on various published studies

Water Health Ghana, an NGO working primarily in urban areas of Ghana charges US\$ 0.07 to US\$ 0.45 for 20 litres³⁷. In Ashaiman, a Peri-urban area of the Greater Accra Region in Ghana where private service

³⁶ Dalberg, 2017

³⁷ Ghana sector Review, Safewater Network

providers play a significant role, the prices³⁸ are around US\$ 0.25 for a 20 litre can. NGOs in some of the big cities in India (Hyderabad, Delhi, Mumbai) charge³⁹ US\$ 0.06 to US\$0.15 for 20 litres. Table 5 below presents water prices data in some Latin American Cities and as can be seen the private tankers charge much higher than utility tariffs in most of these cities.

Table 5: Private Provider Tariffs in Latin American Cities

City/ Country	City Popn. (million)	Households served by Independent Providers (percent of popn)	Type of Independent Providers	Avg Price (US \$/KL)	
				IPs	Utility
Cordoba (Argentina)	1.2	38,200 (15-20%)	Cooperatives (3%) Network (10%) Truckers (2%)	0.42 0.23 1.25-2.50	0.54
Asuncion (Paraguay)	1.0	50,000 (30%)	Small Networks	0.3-0.4	0.4
Barranquilla, Columbia	1.2	52500(20-25%)	Truckers Carters Small Networks	5.5-6.4 0.54	0.55
Guatamala City	>2.0	>78,500(32%)	Truckers Community Systems Pvt Networks	2.7-4.5 0.33-0.58 0.42	0.42
Lima, Peru Ica, Peru Cuzco, Peru	5.2	26-30% 10% 30%	Truckers Pvt Networks Community Systems	2.4 0.21 0.34-1.20	0.28
Santa Cruz, Bolivia	1.0	100%	Cooperatives	0.25-0.55	NA

Source: Independent Water Entrepreneurs in Latin America, April 2003, The World Bank

Invariably, the off-grid prices are unregulated with neither the utility nor the local governments involved. While these prices do impose a significant cost on the households, people are paying as they have few alternatives, and in many instances, they do see a value in terms of time saved and improved health outcomes.

It is worth noting that the off-grid costs are full cost recovery (i.e. with no subsidy), and at small scale of operation, whilst the service provided by utilities receives both capital and operating subsidies with operations at large scale. This is captured in the following quotation *“Private water vendors do not possess the same economies of scale as the government water supply network, and, also, do not benefit from any subsidies. Therefore, the mere fact that vended water is more expensive than public utility water does not imply that the water vendors in the private water market follow inequitable pricing strategies.”*⁴⁰

7.4 Customer Affordability

Customers consume to a level that they can afford – but that does not mean it is a level that they would desire in an unconstrained world. From the perspective of SDG 6.1 compliance a ‘basic’ level of consumption of 40 lpcd at the household level has been assumed for off-grid services against 100 lpcd – what most piped customers are getting. Based

³⁸ Megan Peloso et. al.

³⁹ USAID & Safewater Network (2016)

⁴⁰ Aditi Raina, 2018.

on a 40 lpcd and 100 lpcd consumption for off-grid services and piped systems respectively, the monthly household water payment has been computed and compared to the estimated household income of the lowest quintile. While there is no universal definition of affordability practitioners frequently use 3 percent of household income as a rule of thumb. What is clear from table 6 and the graphic from WaterAid (Figure 16) that follows is that buying a minimum amount of water from an off-grid supplier would far exceed that limit in most cases.

Delivery of an acceptable amount of safely managed water to the household will therefore clearly require a comprehensive assessment of costs and subsidies if the SDG requirement of ‘affordable’ is to be met.

Table 6: Estimated Water Bill Affordability – Urban Piped and Off-Grid Services

Location	Service Type	Unit rate US\$/m3	Monthly cost for house of 5(US\$) ⁴¹	Monthly household income of lowest quintile (US \$)	Water bill as % of household income
Nairobi	Piped (public)	0.33 (1st Slab upto6k)-52 (2nd Slab)	4.95	190	2.6%
	Off-grid (pvt tankers)	7	42	190	22.1%
Port-au-prince	Piped (Public)	0.25	3.75	175	2.1%
	Off-grid (pvt Kiosks)	4 to 29	24	175	13.7%
Bangalore	Piped (Public)	0.15	2.25	225	1.0%
	Off-grid (Kiosks)	3.5-10	21	225	9.3%
Cordoba	Piped(Public)	0.25	3.75	100	3.8%
	Off-grid (pvt Tankers)	2.5	15	100	15.0%

Sources: Tariff data from Utilities, IBNET, and Income data from Government documents

Figure 16: Off-grid Water is Unaffordable to the Poor



Source: Briefing paper from Wateraid

⁴¹ Considering piped systems with 15 KL monthly household consumption@100 lpcd, and off-grid systems with 6 KL monthly household consumption@40 lpcd.

7.5 Governments are treating the rich as if they are poor and vice versa– the challenge of current subsidies

Paradoxically, it is observed that the governments treat the rich or those who can afford to pay for water as if they are poor by providing huge amounts of direct and hidden subsidies. As noted already there are inbuilt capital and operating subsidies in the price that the utilities charge to the pipe connected users, most of who invariably are not poor.

At a normative US\$ 265.6 per capita capital cost for urban water supply, the capital subsidies work out to be about US\$ 25.6 per capita per annum approximately spreading capital costs⁴² over 15 years. In addition, if it is assumed that, on average, 65percent of O&M costs are subsidized for the piped customers, the operating cost subsidy is US\$ 16.6 per capita per year⁴³. Thus, the piped users get an average subsidy of US\$ 42.2 per person per year whereas the unconnected (and generally the poor) get zero subsidy. This subsidy amounts to US \$17.6 / household/ month for a family of five.

If that level of subsidy was applied to off-grid customers, then Table 6 would look much different as shown in Table 7. While still not perfect, this quick analysis shows that the subsidy would reduce the burden of monthly water bills and at the same time provide an improved service.

Table 7: Estimated Water Bill Affordability – After Application of Subsidy

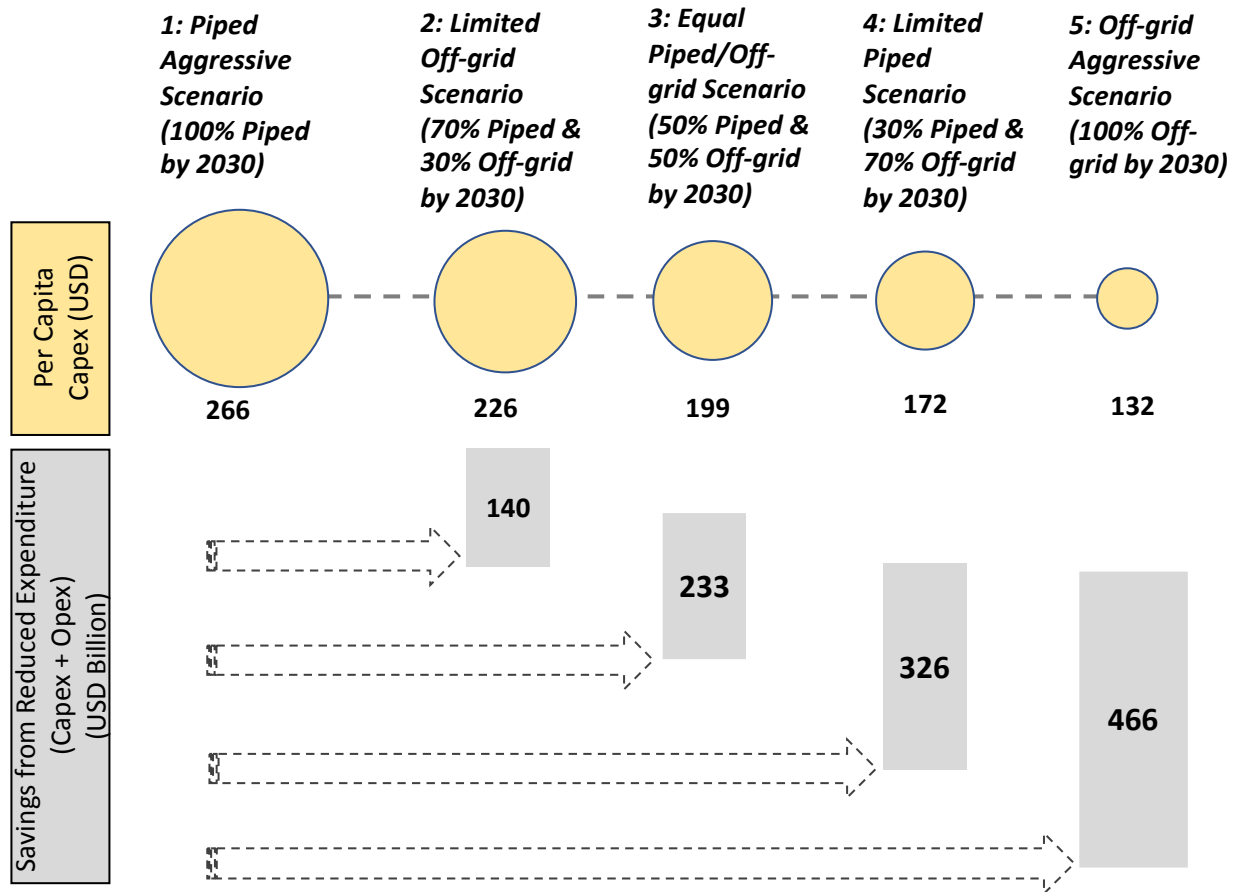
Location	Service Type	Unit rate US\$/m3	Monthly cost for house of 5(US\$) @40 lpcd	Monthly household income of lowest quintile	Water bill as % of household income	Monthly cost for house of 5 after US\$17.6 subsidy	Water bill after subsidy as % of household income
Nairobi	Off-grid (pvt tankers)	7	42	190	22.1%	24.42	13%
Port-au-prince	Off-grid (pvt Kiosks)	4 to 29	24	175	13.7%	6.42	4%
Bangalore	Off-grid (Kiosks)	3.5-10	21	225	9.3%	3.42	2%
Cordoba	Off-grid (pvt Tankers)	2.5	15	100	15.0%	0	0%

An alternative way of looking at this would be the reduction in expenditure and hence the subsidies as the dependence on piped systems is reduced. Therefore, depending on the extent of off-grid focus as shown in Figure 17, the total savings from reduced expenditure (capex + opex) over the period 2016-2030, would range from US\$ 140 billion to US\$ 466 billion, which will result in reduced subsidy requirement from the Government.

⁴² Annualized over 15 years @5% interest

⁴³ Assuming 65% subsidy on O&M cost of US\$25.6 per capita per year (US\$ 0.7 per KL and consumption of 100 lpcd)

Figure 17: Potential Savings under various Off-grid Scenarios



In summary this section has highlighted the need to consider a rebalancing of the presently distorted subsidy regime so that capital and operational subsidies are more equitably allocated to attain the SDG goal of an affordable price for basic services regardless of service delivery method.

In an ideal scenario, the subsidy regime should:

- direct subsidies to those who cannot afford to pay for service delivery costs rather than to those who can
- equitably allocate subsidies to attain a goal of an affordable price for basic service regardless of service delivery method;
- targets subsidies to the poor who cannot afford market rates and subsidize them to the extent that they get an essential quantum of water
- incentivize the service providers to improve their efficiencies and charge only the efficient costs (i.e. optimize capital costs, reduce O & M costs, reduce non-revenue water, increase billing and collection efficiencies and reduce overheads)

- ensure a smooth flow of subsidies with minimal overheads to administer them and limited scope for leakages

It is easier to target the subsidies better in the off-grid option as the subsidies can be given directly to the poor users rather than to the inefficient utilities which service both the rich and poor. The governments can give direct subsidy to the poor and ask them to pay market prices to the private water provider/ NGO. Giving subsidy directly to the poor and giving them the choice to choose any available supplier from the market will also enhance competition and deliver better services.

Going forward, if the prices charged by the private off-grid providers can be better regulated and the poor are given targeted subsidies by government, it may be feasible to make the monthly off-grid water bill very much more affordable whilst still delivering a basic level of service which is SDG compliant (safe, accessible, and affordable).

8. Way Forward - Reimagining Urban Off-Grid Services as SDG 6.1 Compliant

8.1 Commitment to change strategies, policies and more

If countries are to achieve their commitments to SDG 2030 Goal “achieve universal and equitable access to safe and affordable drinking water for all” their strategy should shift to include a renewed consideration of “Off-grid” solutions to complement their current narrow attention to On-Grid services.

Such a strategy should leverage the private sector to offer the off-grid services particularly to the poor, the unconnected urban, and the residents of newly urbanizing areas. The ideas in this report present a vision where all urban dwellers have access to a basic level of service at an affordable price regardless of method of service delivery. It goes against the historic approach and entrenched interests of many stakeholders – governments/donors who traditionally support piped network expansions, utilities whose main interest is expanding piped supplies from source to tap, private entrepreneurs who are unregulated, activists who believe that governments are shirking their responsibility when they deliver using private sector intermediaries, large global NGOs who believe that private sector uses extortionary practices and champions for the poor who believe that the poor should be given free piped water supply.

While the concerns and criticisms are valid, these ignore the situation and experience on the ground that public and private sector complementarity can be made to work for the benefit of the poor or the unserved. This requires that institutions are better designed, policies are more clearly articulated with clear objectives, regulations and checks and balances are put in place and implemented in letter and spirit and necessary capacity is built and the whole process of rolling out is executed with proper change management.

This report has highlighted some key takeaways which should weigh on the mind of donors, policy makers and local governments:

- (i) Coverage with piped water services is declining as traditional utilities fail to keep up with rapid urban growth. Over the period 2000-15, the global urban population has increased by 1.1 billion yet only 900 million people gained access to piped supplies.
- (ii) Currently, globally 677 million urban residents receive a service that is not safely managed and thus not compliant with SDG 6.1.
- (iii) A significant proportion of the people currently served by off-grid are the urban poor.
- (iv) The number of people reliant on off-grid solutions will increase over the period to 2030. If past increases in access to piped service continue then a further 300 million people will find themselves availing of off-grid solutions in 2030 with that growth predominantly in Africa, South Asia and Latin American regions.
- (v) The total number of people reliant on off-grid services will be close to 1 Bn in 2030.
- (vi) Off-grid services receive almost no subsidy compared to piped customers who receive some US\$ 42/person/year through subsidized capital and operating costs.

- (vii) Without a change in the service provision and financing models off-grid services will remain non-compliant with SDG 6.1 – unable to deliver sufficient quantity, quality, availability or affordability to those without access to piped supplies.

There is a need to rethink off-grid service arrangements if governments want to improve service to the poor and achieve their commitments to SDG 6.1.

8.2 Big questions that need to be debated and addressed

Making the move from a policy that won't deliver SDG6.1 (i.e. a sole focus on piped supplies) to one that has the potential to deliver on SDG6.1 (i.e. a complementary mix of piped and off-grid solutions) will require responses to multiple challenges. These relate to:

- **Policy** - How should the governments define their programs and priorities with respect to grid and off-grid solutions?
- **Legal & regulatory** - Are the existing laws adequate to encompass “service for all” regardless of service delivery method or are changes/new laws required? Who will set the standards and who will monitor the adherence to standards? Who will regulate and what will they regulate- licensing, service quality, pricing etc.?
- **Institutional** - What should be the roles and responsibilities of the public and private sector be in service provision with respect to off-grid supply? What roles should NGOs play? How can competition be introduced in the market?
- **Technical** - How should governments ensure that water is treated using the right technology that results in acceptable quality at the users’ end? Can the technologies chosen work at scale? How cost-effective are these technologies? How should investments be prioritized?
- **Technical** – How can innovation deliver better and more efficient ways of distributing and storing water and the household level? How can donkey carts and push carts filled with dirty jerry cans be replaced with modern equipment that delivers/stores adequate amounts of safe water.
- **Financing** - Where will governments get the funds to finance capex? Who will finance the capex required by private players? How can capital subsidies be better used? Who bears the recurring operating costs and who gets the subsidy, and how should the subsidies be targeted? How should the recurring subsidies be financed? How can technology and institutions make it easier for the users to buy water or get subsidy?
- **Water Suppliers** - What capacity building support is required to bring in more professionalism in the sector? How can support be provided to bring about a change in mind-sets of the government, utility, and citizens on accepting their changed roles and responsibilities?

8.3 Managing the change responsibly

Change management is crucial if these ideas and models are to succeed. Rewriting of policies to make them service delivery oriented rather than pipe oriented, recognition of private players (and formalizing their role and supporting them to professionalize), recognition of legal barriers (such as land tenure, jurisdiction boundary issues) and removing the hurdles, designing and implementing a targeted direct subsidy mechanism and giving a choice to the consumer are some of the more important steps that the

governments must undertake, along with acceptance of the changed role of the conventional utilities. The understanding of the traditional providers, both piped and non-piped, would have to be improved with supporting capacity building so that they can work together to the public good.

When this different vision is adopted, then a re-imagined sector could arise. Instead of pushing old carts loaded with unsanitary jerry cans around low income areas, smart entrepreneurs could be delivering adequate quantities of clean water to individual households using sanitized and modern transport arrangements. Poor households would benefit from better health, more time for productive uses, and an increase in disposable income. A more competitive market would appear between off-grid and piped service provision, and between off-grid providers.

As noted in this report there are multiple vested interests both for and against this paradigm shift. A holistic reform approach will be needed which gives due attention to the political economy of the proposed changes. Superficially it would appear that the challenge is so great that all actors will need to work together if the goal is to be achieved, and all actors can benefit.

8.4 Next steps

This report has set out to provide a baseline assessment and problem statement and argued that the sector cannot continue with a business-as-usual approach, essentially a laissez-faire approach to non-piped supplies, but going forward, the focus should shift to proactively including “off-grid” solutions into the mix of approaches to meet the SDGs. Such a shift would leverage the private sector to offer the off-grid services particularly to the poor, the unconnected urban and the newly urbanizing area residents who currently face an inequitable struggle to satisfy a basic human need, as compared to their more fortunate neighbors with piped connections.

These ideas and questions raised need to be further debated and developed. The proposed next steps are therefore to put out this report into the public space for stakeholders to debate and raise concerns, support and reinforce the key messages and further develop the models based on 6-7 detailed case studies. Each of the challenges identified need to be addressed first at a generic level and then at a country or city specific level to start preparing a clear road-map to roll out the agreed models and actions. Various practitioners can contribute to this initiative as the challenges are wide ranging and could be shared.

The goal of this work is to develop a reimagined off-grid service sector which is SDG6.1 compliant providing sufficient safely managed water, accessible at the household level, and which is affordable to customers.

The key next steps are presented in Chart on the next page.

**Regional Deep-dive
(detailed assessment
in 6-7 cities)**

1. Discussions with off-grid providers to gather more data to better understand the costs, charges, service standards (quality and quantity), and affordability associated with off-grid services
2. Conducting city level situational assessments for 6-7 cities w.r.t policy, institutional, financing, and regulatory environment for off-grid implementation to get a representative mix with differing situations of 'off-grid' supply and differing roles played by public and private provider
3. Investigating more innovative technical solutions that can provide adequate quantities and qualities of water to households and for households to be able to safely manage that water on-site.

**Analytical
tools/models/templ
ates development**

1. Developing specialized analytical tools to assess the current situation in different cities to gather baseline data and design a changed system.
2. Refining the indicative institutional models presented in this report
3. Drafting policy text to capture a shift towards SDG 6.1 compliant service delivery as the government's end goal - not just the provision of piped services
4. Rethinking regulation and regulatory approaches to off-grid providers
5. Revisiting subsidy policy to develop a more equitable model that will facilitate investment in SDG6.1 compliant off-grid solutions which are affordable
6. Investigating more innovative technical solutions that can provide adequate quantities and qualities of water to household and for households to be able to manage that water safely on site.
7. Developing templates to make it easy for identifying specific challenges to transition from a current situation to a new model and brainstorm possible solutions for each context

**Pilot
implementation
(in 2-3
cities)**

1. Support governments for preparation of model contractual and regulatory documents for promoting a vibrant competitive private providers market, especially active in the distribution area, to pilot the proposed model in a city.

Annexes

Annex 1: The additional issue of Rural-Urban Interface People

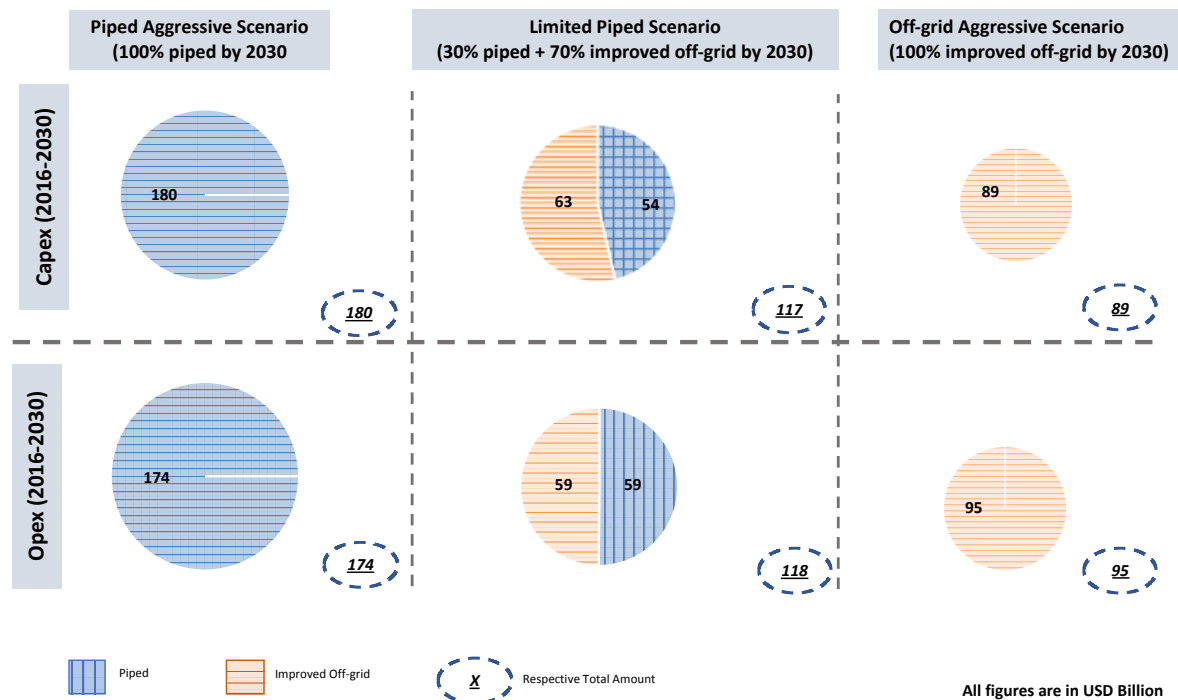
In addition to the ~1.9 billion urban people have to be moved up the JMP ladder and provided safely managed water, there are a significant rural interface people who reside on periphery of urban areas, who have urban characteristics and aspirations and who need to be provided with safely managed water considering the current the service levels as per the JMP ladder in such areas range from no service to basic (catered by unimproved off-grid solutions). The services the rural interface population presently gets makes them similar to services to the “bottom of the ladder” urban people.

Based on rapid assessment of 6-7 cities, the “rural-urban interface” population can safely be assumed to be about 20percent of the present rural population and hence represent ~677 Million additional unserved population globally. Even if the current rural interface population gets absorbed in future urban areas and hence get accounted for in the urban population, lack of safely managed water to such rural interface areas will always be a dynamic issue as people residing just outside the urban jurisdictions will have similar level of urban characteristics and aspirations and hence are a crucial population while considering the magnitude of the increasing unserved and under-served population.

Hence, additional 677 million Rural interface population need to be moved up the JMP ladders and provided safely managed water by 2030 in order to meet SDG Goal 2030.

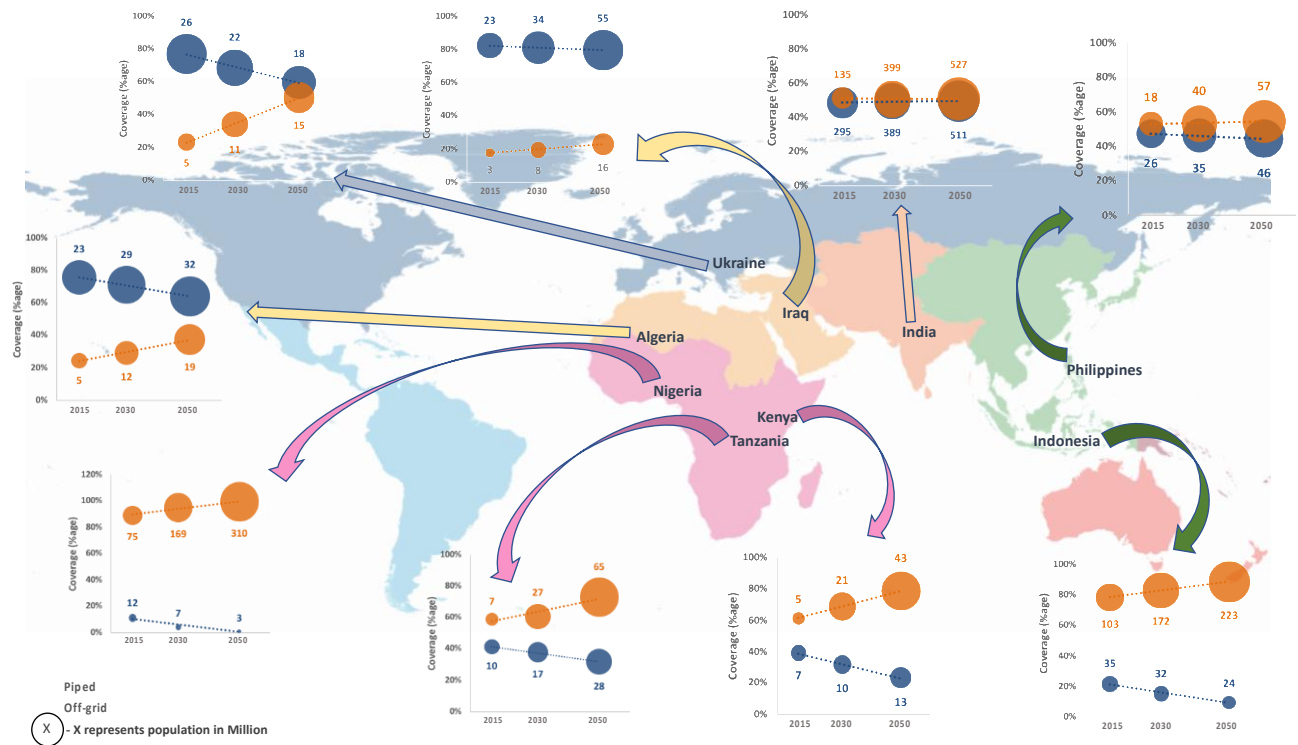
Considering the similar options (as considered for providing safely managed water to urban populations) as well as same capex and opex assumptions for providing safely managed water to Rural Interface Population by 2030, the impact of different mixes of traditional versus complementary off-grid solutions is compared in Figure 18 below.

Figure 18: Additional Capex and Opex (2016-2030) to meet SDG 6.1 under different scenarios for Rural Interface



Annex 2: Country-wise Piped and Off-grid Coverage Projections

Figure 19: Country-wise Piped and Off-grid Coverage Projections



Annex 3: Inequality in Water Services

To examine inequity issues, JMP classifies all people by economic levels from ‘Poorest’ and ‘Poor to Richest’. However, not all countries give this information and so it is not possible to aggregate the economic background of the urban people with no improved water services. Wherever it is possible to aggregate, there are interesting observations. For example, of the 30 million urban people in SSA without improved water services, as many as 13.7 million are the urban poorest. Similarly, in South Asian countries of Bangladesh and Pakistan, of the 5.6 million without improved water services a significant million people belong to the urban poorest/poor category.

Figure 20: Indonesia- Urban Population with no improved water- by Income Categories (2012)

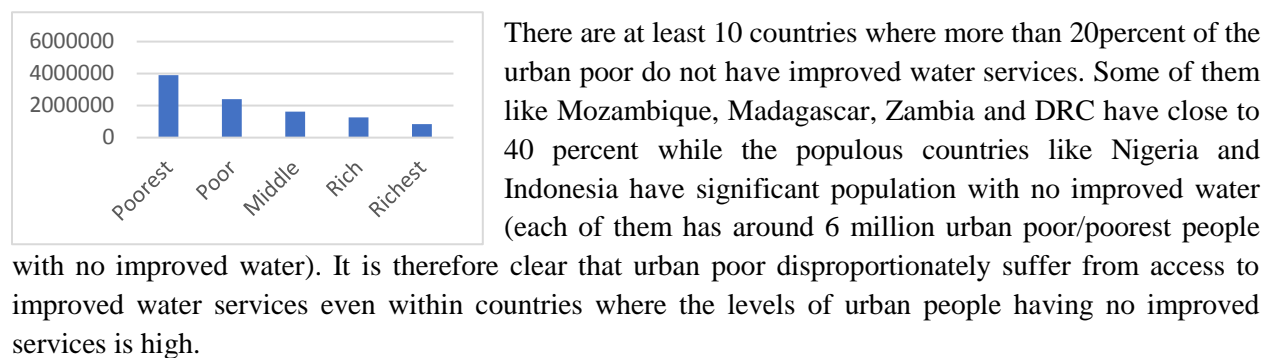
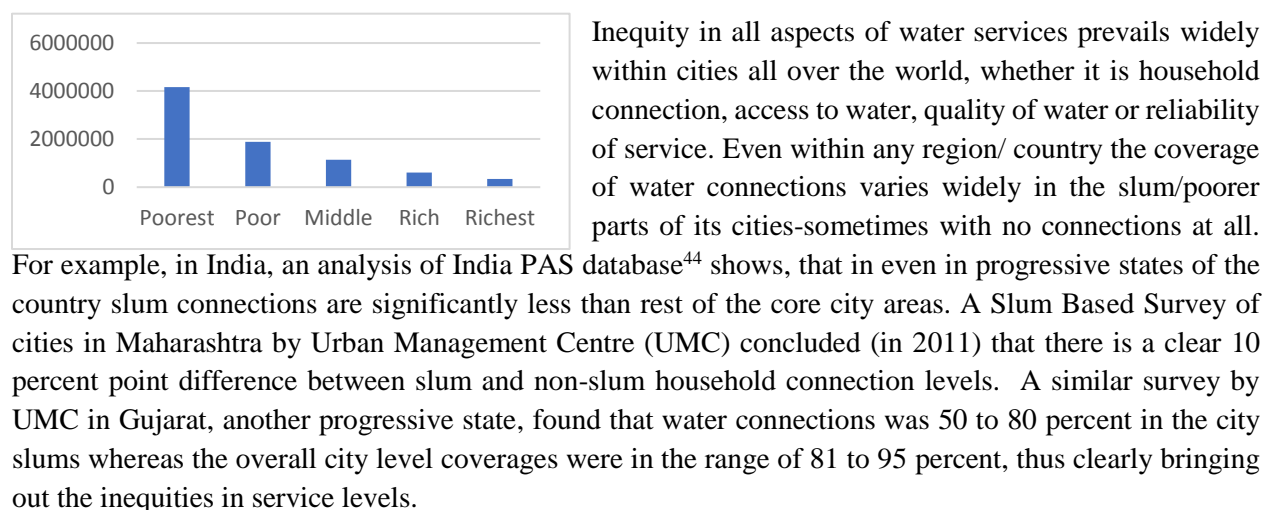


Figure 21: Nigeria- Urban Population with no improved water- by Income Categories (2013)



⁴⁴ Performance Assessment System Project, July 2011

Annex 4: Note on Private and NGO Small Providers

An IFC Report that looked at the market finance issues of community-based organizations (CBOs) in Kenya⁴⁵ noted that they are important providers of water supply services in peri-urban and rural areas that are not served by publicly owned utilities and that about 1,200 small piped water systems operated by CBOs serve 3.7 million people throughout the country (in 2010). A field survey-based study conducted in Kenya⁴⁶ by UNDP informs that the private small providers are important, significant and can play a big role if certain measures are taken and issues addressed.

Similarly, in Tanzania there are good examples of CBOs working in partnership with the public sector. Many of these service providers come from the private sector and operate as for-profit enterprises looking at water as one more business in their portfolio. Though there is inadequate research into understanding the people behind these operators, the available research suggests that: (a) they are usually local operators (b) the businesses are small in scale (c) they operate asset-light businesses with minimal investments and (d) they are risk takers taking the regulatory, payment, water source and business disruption risks.

Box 9: Partnership with Community Based Organizations-Tanzania

In Tanzania, community-based organizations have partnered with public utilities to make drinking water more accessible in under-served areas of Dar es Salaam, known for chronic water shortages, unreliable water supply and poor infrastructure. With the failure of the Dar es Salaam Water and Sewerage Corporation to supply water to the entire city, these small-scale community organizations remain important middlemen that bridge the gap between customers and the utility. Major successes of the partnership include the construction and maintenance of secondary pipes which enable the organizations to connect households and private water vendors for a fee, improvements in service delivery compared to the previous direct supply by the utility, and opportunities for the utility to delegate operational responsibilities.

(Source - Extracts from “Ellis Adjei Adams, Daniel Sambu & Sarah L. Smiley (2018): Urban water supply in Sub-Saharan Africa: historical and emerging policies and institutional arrangements, International Journal of Water Resources Development”)

A study of small water players by PPIAF in El Salvador⁴⁷ noted that....” A mobile provider may operate its own water source, buy from a third-party private source, or just retail water purchased in bulk from the trunk utility. Truckers may serve households directly, deliver water to a community storage tank, or even supply a local fixed network serving a group of standpipes or house connections. Private well or source operators can serve tankers, but also offer backup service to the official utility during periods of drought. Diversity is endless because small entrepreneurs must permanently adapt to their clients’ needs. Characteristics common to them all are that they operate with limited government oversight, no government support, and must compete for customers.”

Scale is an issue for the sustainability of these small service providers. They seem to serve a small number of households- from as little as 50 or so to a high of no more than 3000 households. According to a 2005 World Bank Report⁴⁸...” In Latin America and the Caribbean, where urban coverage is high, SPSPs more

⁴⁵ IFC 2010, Rajesh Advani

⁴⁶ UNDP 2011, Degol Hailu et.al.

⁴⁷ PPIAF 2006, Alexandra Ortiz et.al.

⁴⁸ World Bank 2005, Mukami Kariuki et.al

frequently take the form of piped water systems, mainly Peri-urban, small town and rural; in South Asia, SPSPs seem to focus on gap-filling activities with many tankers operating in various cities.” Often, they are the main service providers as the users are not connected to piped networks of the utilities and do not have any off-grid service from the local utilities. However, there are also instances of such small service providers being the aggregators/ intermediaries between the utilities and the users, particularly in cases where they source the water from the utilities. These small private providers operate broadly as on-grid or off-grid providers under various types of licensing arrangements, including in some cases without licensing and illegally. Table on next page summarizes the prevalent institutional arrangements with features of their operations.

There have also been instances of international water NGOs who work with local NGOs/private service providers to bridge the gap though the scale of such operations is invariably limited. WSUP and WaterAid are just two examples of such international organisations that collaborate actively with local NGOs. (See Annex 4 for a profile of select NGOs active in water service space).

Box 10: International NGOs work with local NGOs in Mozambique

From 2009 to 2015, WSUP supported FIPAG and AdeM to extend networked water access in 13 bairros, including the installation of about 100km of new tertiary networks. Of the 15,400 customers connected to the new network, about 3,000 were existing customers who were receiving a substandard service. A total population of approximately 148,500 have benefitted with access to safe water supply through the programme (a number that will increase with time). Affordability for low-income customers has been a major strength of the programme: combined with WSUP-led awareness campaigns, the reduced connection charge and option of staged payments contributed to a surge in demand, bringing about a 100% increase in water coverage in the target bairros from approximately 36% to 73%.

(Source: Extracted from WUSP “Balancing financial viability and user affordability: An assessment of six WASH service delivery models-Topic Brief | August 2017)

Another interesting way of classifying such service providers active in the Peri-urban space was provided by Adriana Allen, Julio D Davilia and Pascale Hofmann⁴⁹ in 2006 when they studied 5 metropolitan and 10 localities and they classified such providers as playing in the “Policy Driven” or “Needs Driven” space explaining that policy driven are formal mechanisms explicitly supported by the state (such as private tankers licensed to sell) whereas needs driven are those arrangements where private sector or CBOs step in to fill a gap and are rarely supported by the state. They painted a “water supply wheel” concept that outlines a continuous spectrum of policy and needs-driven practices characteristic of water provision in the Peri-urban interface. The paper concludes that... *“The five cases show that access to water and sanitation by poor Peri-urban dwellers is mainly needs-driven and informal rather than the result of formal policies. The key to structural improvements in water and sanitation lies in the recognition of these practices and their articulation to the formal system under new governance regimes”.*

And the small service providers do make a big impact. While the overall market share of small service providers is not known clearly due to absence of detailed research on such players, a 2005 World Bank Report referred to earlier documented several cities around the world where these players had significant shares. According to this report... *“Overall, it is estimated that up to a quarter of the urban population in*

⁴⁹ IIED 2006, Adriana Allen et. al.

Latin America and nearly half of urban dwellers in Africa rely on small-scale private service providers (SPSPs) for at least a portion of their water supply.”

In some countries, such as Cambodia, their market share is significant (up to 50percent). Similarly, in some cities, their market share is quite high (for example Asuncion city in Paraguay, in Karachi in Pakistan, Ky Cham in Cambodia, Cotonu in Benin, Onitsha in Nigeria and Dar es Salaam in Tanzania). In Luanda, Angola where the public utility Luanda Provincial Water Company (EPAL) has failed to service the peri-urban areas, the informal water suppliers is estimated to be around US\$ 250 million a year serving 4 million residents in 2009. Half the city of Cochabamba in Bolivia is serviced by private tankers or community owned systems as the city utility has failed to provide service.

Cochabamba Metropolitan area is an important urban settlement in Bolivia which has a history of a controversial failed water privatization in late 1990s. Privatisation was overturned after big rate hikes and strong public protests but after almost two decades, SEMAPA’s (the utility) piped network barely reaches half the residents-mostly limited to high and middle-income families in north and central zones. Where it has not reached, people have figured out their own solutions. Most residents in the city depend on *aguateros*, *the trucks that deliver water of suspect quality (and often unauthorized) taken directly from privately owned wells*. For example, Alto Buena Vista, a hillside settlement in the south, trucks are the only source of water. But just a little distance away, in Maria Auxiliadora, the community has come together and now hundreds of households have a steady, piped water connection. A community well taps water from an aquifer and the water is pumped first to the top of the hill and then distributed to over 300 households in the community.

Table 8: Locations with High Percentage of Private Water Service

Regions and Locations	Population Served (%)
AFRICA	
Benin, Cotonou	69
Côte d'Ivoire, Niangologo	68
Côte d'Ivoire, Boundiali	50
Guinea, Conakry	66
Kenya, Nairobi	60
Kenya, Mandera	90
Mali, Kayes	69
Mali, Bamako	63
Nigeria, Onitsha	95
Senegal, Diourbel	90
Sudan, Khartoum	80
Tanzania, Dar es Salaam	56
LATIN AMERICA & CARIBBEAN	
Bolivia, Santa Cruz	100
Haiti, Port-au-Prince	70
EAST ASIA AND PACIFIC	
Cambodia, Ky Cham	50
SOUTH ASIA	
Pakistan, Karachi	40-50

(Source: Mukami et al, 2005)

Similarly, public utility has failed in Haiti. Port-au-Prince in Haiti is a city where significant number of local people are employed in the “water industry”. It is estimated that while the water utility employs just under a thousand people, the water industry in the city gives livelihood to over 25000 families. While the utility serves only about 15percent of the population, about half the population use truck water, mostly untreated and about a third use bagged water. A small percentage buy water from water kiosks run by about 2000 private kiosks.

Box 11: Cochabamba-where private and community solutions coexist

In many cities in Asia, Africa and Latin America, the private tankers play a very significant role in the water services market. Though occasionally, these very transporters also collect water from public utility as a wholesaler but primarily they act as transporters who source water from nearby Peri-urban areas and supply to residents who may have no connections at all or who may have piped connections but inadequate quantities in their pipes.

Box 12: Private Water Providers are significant in Chennai, India

Chennai in South India is a large metropolitan area with over 10 million population that has perennial water problems with its main public utility Chennai Metrowater unable to service all with adequate quantities of water despite tapping all sources, including desalinating sea water. The private tankers in the city supplement with their ground water sources from Peri-urban areas and are significant players. The Chennai City Metrowater & Private Water Lorry Association, a formal apex body claims that there are over 2000 private tankers, making several trips in a day (sometimes 5 to 6 per day) carrying 8-12000 litres each time to serve the unserved, act as a top up for the large number of households with pipes but inadequate water supply and commercial establishments who find public sources inadequate. The water charges at INR 200-250 per KL (US \$3-4) are many times higher than the tariffs charged by the public utility.

Box 13: Private Players are key in many Cities in Latin America

Independent providers in Latin America run a wide range of product and service lines, of ownership patterns and of size. An individual with a push cart, selling water by the glass, bag, or gallon, can reach between one and two hundred people daily; a trucker who carries water house to house can generally serve between 70 and 350 households, or between 400 and 1500 people each day. The more complex providers operate network systems that generally serve anywhere from a hundred to several thousand households on a sustained basis, although such companies were found starting up with as few as 10 customers. The average independent network in Asuncion counts about 1,000 customers.

Some independent providers distribute utility produced water, but others get water from private sources, usually on the city's outskirts. Private water producers with deep wells, dams, and sometimes treatment plants both sell to secondary distributors and maintain private networks and, in some cases, run their own distribution companies. In Lima, where the law forbids private water production within the municipal perimeter, over 60 private wells on the city limits provide water to the independent tank truckers- and to Lima's official water company too when official sources run dry.

While low-income residents provide the main staple of the independent providers, the other market niches are important. These include middle class housing developments whose developers found it simpler to build self-contained water and sanitation systems, cluster of vacation homes at the beachMany middle-income urban households in Guatemala City have dual connections-one from the municipal utility and another from an independent network.

(Source: Extracted from “Independent Water Entrepreneurs in Latin America- The other private sector in water services” by Tova Maria Solo, April 2003, The World Bank)

(

Irrespective of their profiles, the private providers serve an extremely useful purpose of filling the service gap in a large number of developing country cities, serving the urban poor or unserved in Peri-urban areas. Invariably, majority of the non-piped supplies of water in the urban areas in the developing countries of Africa, South and SE Asia and Latin America regions (which account for about 482 million of the global 568 million non-piped improved water users) is serviced by off-grid small service providers.

Invariably, it is the non-piped improved water users that are serviced by the private, and to a limited extent, by CBO/NGOs. A small portion of their clientele also comes from those with piped access who are not getting adequate service through the pipes. Of the nearly 500 million or so urban people with non-piped improved water in the developing countries, almost 70percent are in 7 of the populous countries like India, Indonesia, Nigeria, Bangladesh, Pakistan and Philippines (113 million, 99million, 68 million, 34 million, 28 million and 18million respectively). There are at least 44 countries with over a million such urban residents with 13 of them having over 5 million urban residents with non-piped improved water.

Thus, the total urban unserved and under-served market that is serviced satisfactorily or otherwise is huge. What is evident is that the non-state actors, mostly small private (complimented in a small way by NGO/CBO players) are actually serving this market, not only servicing the unserved in peri-urban and other unserved areas, but also in reaching the water services to the poor whether in slums in core city areas or poor in Peri-urban areas. Though macrolevel data is not easily available about the proportion of poor in Peri-urban areas, it is well known that, in developing countries, the socioeconomic status of Peri-urban residents is well below that of the core city residents (excluding slum residents) and further that the small service water providers do fill a big gap in the water services to the poor and the Peri-urban.

Box 14: Local NGOs active in Peri-urban India

The slum of Purvidin Khera is situated about 15 kilometers away on the outskirts of the city of Lucknow in Uttar Pradesh, along the Hyder Canal with 210 households and a population of 1100 on the right side of the canal and about 131 households and a population of 680 people on the left of the canal. It is one of the few examples of non-notified slums where, through intervention of the non-government organization and the governmental aid, the mini piped water supply scheme has been successfully implemented....According to the secondary data collection through Vigyan Foundation, till date, in the first functional water source details the total number of households which benefitted through submersible and mini water pipe lines in the year 2015 was 45 and in 2016 was 40. In the second functional water source details the total number of households which have benefitted through submersible and mini pipe lines in the year 2015 was 24 and through hand pumps and mini water pipelines in the year 2016 was 22. (Source: Extracted from "Water Supply for Urban Poor in India" by Priyanjali Bose (WaterAid) and Puneet Srivastava (TISS), 2017)

In recent years, Water Kiosks (or Water ATMs as they are known in some countries like India and Kenya to represent Any Time Water Machines) have also become popular as another mode of providing drinking water service to the urban poor. In the Indian cities of Hyderabad, Delhi, Mumbai and Vizag for example, there are an estimated over a 100 Water ATMs run by NGOs which sell treated water to the poor at market rates which are reasonably affordable.

An unpublished study by Deloitte India⁵⁰ of water service patterns amongst urban poor in 2014 found that urban poor make a very definitive distinction between “drinking water” and “water for other purposes” and they value the drinking water much more highly than water for non-drinking purposes (here drinking water includes water for drinking and cooking). The poor families, particularly the women in the families perceive a strong link between health issues and absence of good quality drinking water. In addition, they attach high value to the time saved in getting such water which is available when they need, compared to other options where lack of definitive time of availability and long queues take away a lot of their valuable time.

Box 15: Nairobi Water reaches out to the Poor through ATMs

The Nairobi Water and Sewerage Company (NWSC) in Nairobi which is not able to reach all residents with services has found success with one solution in Mathare, the “Water ATMs”. Residents in Mathare spend just half a shilling (50 cents) for each jerrycan of water. Nairobi Water delivers the water directly from its own sources. These ATMs supply water through a smart card-based payment system. Users top up their cards with credit and then use them to buy water through the ATMs. Nairobi Water remotely monitors each tapping point. The ATMs record every water transaction, including the user and the amount of water thus giving useful data to Nairobi Water. Source: NWSC Website

This understanding and consequent demand has created a market for urban small service providers, (both NGOs and private, which has resulted in many water kiosks / ATMs coming up in cities. Some of these are managed by NGOs such as Sarvajal, Waterlife, Rite water, Bala Vikas and Naandi, and some are operated by local private operators such as franchisees or own businesses. They typically sell 20 litre plastic water cans on pay-as-you-collect basis. They operate in both peri-urban and urban slums as also in rural areas. Some of them are primarily in rural areas and recently started in peri-urban areas. Typically, they source water from utility tankers or ground water and treat the water with different techniques including in some cases Reverse Osmosis.

Box 16: Water ATMs in Urban Slums in Delhi, India

Sarvajal’s Water ATMs are automated water dispensing units, which provide communities with 24/7 safe water access. They are solar powered and cloud connected, thus enabling remote tracking of the water quality and of each pay per use transaction.



Thus, complimenting the work of local small NGOs and private operators, there are now quite a few large NGOs, that work at national and sometimes multi-national levels, with local CBOs/ NGOs in sourcing/ producing and distributing/selling water of an acceptable quality and are usually referred to “safe water enterprises (SWEs)”, as they invariably sell treated water unlike many small private operators who distribute available water whether treated or not. Many of these receive funding from philanthropy and Impact Funds to set up and scale up their operations.

A recent (2017) study of 10 such SWEs by Global Consultancy Dalberg⁵¹ emphasised their strongly driven social commitment

⁵⁰ Paying for Water Report, Deloitte

⁵¹ The State of the Safe Water Enterprises Market Report, Dalberg

to take safe water to the under-served and unserved poor and estimated that, collectively, they cater to about 3 million people today with an average SWE serving 200,00 (both rural and urban- varying from 25000 to 800,000 people). Some of these, such as the Water Point, India serve predominantly rural users whereas some like Sarvajal, India and Water for People, Malawi serve both rural and urban users (See Annex 4 for a brief profile of some of these NGOs). For example, in Malawi, Water for People works in the peri-urban areas of over a million population Blantyre City. Similarly, Sarvajal, India which serves almost half a million rural and urban people has partnered with Delhi water Utility (Delhi Jal Board) to serve over 10,000 poor families in 6 Delhi slums. Most of these SWEs cater to the poor but not the poorest as they believe in recovering their operating costs to the extent possible to remain financially sustainable. They cater to those poor and low-income users who can afford to pay the small tariffs that are charged. Even with this approach, many of them need support to recover their operating costs.

The potential for scaling up and making a big impact for such water service providers is indeed huge. Challenges to scale up of course is also equally huge. Safewater Network, Ghana which runs 75 Small Water Enterprises serving over 300,000 people from 110 rural and urban communities believes the potential to scale up is huge.

Box 17: Potential for Small Water Enterprises in Ghana (Safewater Network View)

SWEs can: (a) provide reliable, affordable safe water access on a sustainable basis to under-served off-grid communities, provide access to 3.2 million of the 8.3 million people (2,304 of 9,216 communities) that lack access to basic water services, without subsidies, at a cost of USD 35/person; an additional 1.6 million people with subsidies, and many millions more of the additional 14.8 million people who lack on premises access to safe water. (b) reduce system failures: For a one-time capital investment of USD 100,000, an SWE can operate indefinitely with ongoing operating and maintenance costs covered by user tariffs. The low failure rates of SWEs, due to their ‘enterprise’ model, ensure reliable and sustainable access to safe water, and greatly reduce the likelihood of lost investments in systems. (c) attract new funding from the private sector, social impact investors, and entrepreneurs- SWEs could attract GHS 110-132 million (USD 25-30 million) toward the GHS 492.8 million (USD112 million) required to for SWEs to provide access to 3.2 million people without subsidies.
(Source: Extract from Report Summary..... “Ghana Sector Review: Scaling Small Water Enterprises”-by Safe Water Network, August 2017)

Thus, the small private providers play a big role in the off-grid market which itself is a significant part of the overall urban market. While the share of each of the urban water service providers (public utilities, NGOs, private players-small and big) is difficult to estimate globally and their business models are too varied to summarize, an attempt has been made in the diagram below to capture the institutional and market arrangements for urban water services.

Figure 22: Urban Water Service Providers- Estimates of Market Shares & Features

Category	Service Institution	Features	Challenges
Formal Supply (Piped Network) (3.29 billion)	Private Utility/ Concessionaire/Lessee (200 million)	Fully private owned (UK) or long term contract with public sector; tariffs regulated; service parameters specified; significant build/rehabilitate investments (France, Gabon, Brazil, Ghana, Czech, several cities such as Manila, Yerevan, Jakarta)	Concessions worked only in limited cities; issues with political will; engagement with public; unreasonable NRW expectations; inadequate tariffs; risks of high investments without local debt funding
	Public Utility/ Local Body/ Govt Dept. (3.09 billion)	Usually single city or urban agglomeration; occasionally managed by a regional Govt. Dept; wide range from a few thousand to > million households (Japan, Canada, Pakistan, Sri Lanka, India, etc.)	Growing coverage requirement; high NRW; low tariffs; low HR capacity; political interference; underinvestment; low focus on poor or peri-urban users. distorted incentives, focus on capex and poor on O&M;
Informal Supply (water sourced from utilities) (98 million)	Intl NGOs/ Local NGOs/ CBOs 10 million	Local NGOs/ CBOs typically cater to 50 to 500 households; Mostly kiosks; occasional home delivery; high on user education and awareness (Ghana, India, Malawi, Cambodia, Mexico, Pakistan, etc.)	Intl NGOs: understanding of local/ political issues; Local NGOs/ CBOs: issues of scale; All: affordable tariffs but unsustainable; cater to poor; limited support by utility/local Govts; unreliable water sources
Informal Supply (Off-Network) (470 million)	Small Private Service Providers (558 million)	For-profit local private businesses; no or minimal treatment; sell water in 20 L cans or in small bulk to households with storage; (Many Latin American cities, Cambodia, India)	Issues of scale; formal funding; unregulated with at best license to transport water; sell untreated water or free utility water; steep pricing during summers; serve both poor and non-piped users
Unservd (Unimproved Water) (108 million)	Unservd (108 million)	Collection from river/ponds/wells for untreated usage; unregulated	Unreliable water sources; issues of quality of water; high cost-to-connect; high hidden costs (time, health, energy)

In the Figure above, one can note that about 558 million are getting serviced by Private Service Providers and another 10 million by NGOs. The regional distribution of these 568 million shows that Sub-Saharan Africa, South Asia and South East account for bulk of these, about 456 million or 80 percent.

Annex 5: Profile of Select NGOs Providing Water Services to Poor⁵²

1. Water for People

Water for People is a USA based non-profit organization that is now a multi-country NGO. They started its operations in 1991 born out of American Water Works Association. WfP operates across 9 Countries in Latin America (Bolivia, Guatemala, Honduras, Peru, Nicaragua), Asia (India) and Africa (Malawi, Rwanda, Uganda). WfP works in over 30 Districts with 4 million urban and rural people around the world in water and sanitation.

Their Malawi operations started in 2000. Initially they worked on a number of small projects, but in 2006 changed their strategy to focus on three regions- 2 rural and the third in Peri-urban areas of Blantyre City (a city of 730,000 population with 70percent living in informal low cost housing). In Blantyre, WfP works with all stakeholders- the Blantyre water Board and the City Assembly, the civil society and the private sector. Its theme of “Everyone Forever” underlies its efforts to support Water users association to manage water kiosks. WfP supports the WUAs in managerial, financial, technical and human resource aspects. Since the start of the program, WfP has set up 10 WUAs in Blantyre.

WfP started in India in 1996 in state of West Bengal (in arsenic affected areas). By 2007, WfP established a full-fledged India program and by the end of 2010 had its activities in several parts of West Bengal state. In 2012, Bihar was also included in its operations. Their unique “Everyone Forever” effort to provide water and sanitation to Everyone in targeted areas and Cities in two Blocks of a district in West Bengal and all five Blocks in another district in Bihar.

2. Piramal Sarvajal, India

Started in 2008 in India, Sarvajal now serves 430,000 people across 16 India states with over 330 ATM water outlets and 660 Treatment Plants. They have remote monitoring of quality of water and a dedicated team to raise awareness in the community about use of safe water.

3. 1001Fontaine (Cambodia, Madagascar, India)

With an ambition to serve 1 million beneficiaries by 2020, 100 Fontaine is spearheading a wide network of its activities in Cambodia, India and Madagascar over the last 15 years. It has 200 safe water production units that have already benefitted over half a million people, using surface water (or low depth wells) and solar powered Ultraviolet disinfection treatment to provide safe water.

⁵² Many of these NGOs listed here operate in both rural and urban areas but predominantly with poorer and/or unserved customers. By no means is this list exhaustive but it does represent most of the active and largish NGO players.

4.Jibu, Rwanda

Jibu is a for-profit company that prioritizes impact maximization. Their goal is to launch a network of independent social entrepreneurs who, through retail franchise operations, will provide services and create impact. Drinking water is one of Jibu's first services but they ultimately will move into others. Active in 5 Countries of Africa (Kenya, Uganda, Rwanda, Zimbabwe and Tanzania) they have distributed over 54 million litres of water through over 63 franchisees.

5.dloHaiti, Haiti

dloHaiti launched in 2013 currently serve over 300,000 through 500 sales points in Haiti. They operate with 9 Treatment plants located in different regions of Haiti (west, north and north-east). Decentralized "off-grid" water treatment centers produce their anchor product "affordable, clean water". Their investors are Jim Chu an Angel Investor and Founder apart from IFC (International Finance Corporation), FMO, Netherlands, and several others.

6.Bala Vikas, India

Started over 40 years ago, Bala Vikasa is a non-profit devoted to sustainable development. In the water & sanitation area, they work primarily in rural areas of 4 states of India though they have recently begun their operations in Peri-urban areas as well. They typically begin their operations with awareness campaigns and get a high ownership in the community before starting (they insist on mandatory membership with a small fee before beginning operations) They have high percentage of regular customers who, according to Dalberg report quoted earlier, now are exceed 800,000 through over 750 water purification plants.

7.Safewater Network, Ghana & India

Safewater Network was cofounded in 2006 by actor Paul Newman and in 2008 they established field offices in Ghana and India. They work with communities to develop locally owned and managed Safe Water Stations. With 111 stations in Ghana including Peri-urban areas of Greater Accra and 209 stations in India more than a million people have received access to safe water mostly in rural areas.

8.Naandi Community Water, India

Naandi founded two decades ago is a charitable non-profit is active across rural India and in several social areas including safe water. It started its foray into safe water in 2005 and now has more than 400 purification stations in 6 states of India. They have begun work in Peri-urban areas recently.

9.Spring Health, India

Cofounded by Paul Polak of IDE (US based International Development Enterprises) Spring Health is an India based water organization that serves low income rural people through point- of- sale purification and distribution. They serve over 30,000 households in rural Odisha state of India. Using electro-chlorination for purification and selling water at about 7 cents (US) a day they serve over 250 villages with clean water.

10.EcoAlberto, Mexico

Owned by local communities jointly with Danone Communities, EcoAlberto is active in Mexico serving about 35,000 people of low income communities using over 165 sales points in 85 villages in the El Alberto region.

11.Waterlife, India

Waterlife established about 10 years ago (its first store was in 2008) now has presence in 12 Indian states with about 4000 outlets in villages, urban centres and corporates. Waterlife is rolling out their urban model in Hyderabad City in Southern India. Waterlife retail outlet provides 20 litres, 10 litres and 1 litre high quality drinking water jars and bottles in the neighbourhood at affordable prices.

Waterlife attempts to provide end to end solutions using innovative technological platforms and works closely with the community (including awareness creation and providing local employment).

12.Sunlight water Centre, Nigeria

Technoserve and Unilever have come together and set up Sunlight Water Centres (SWC) in 8 Peri-urban areas of Nigeria. SWC essentially combines a borehole and a retail Kiosk selling clean water (and some retain Unilever products). SWCs are planning to market branded sealed water.

13.Swiss Fresh Water, Senegal

In 2012, SFW initiated the “Access to Water Foundation” (A2W). A2W a non-profit manages over 150 water purification machines and sale of water at an affordable price providing local employment and access to safe drinking water to over 300,000 people in rural Senegal. The quality of water and plant performance is monitored remotely.

14.Pharmagen Healthcare Ltd, Pakistan

PHL is a social enterprise set up to promote preventive healthcare amongst the BOP segment of Pakistan. Serving urban Lahore in Pakistan through 17 shops, PHL focuses on low/middle income customers selling water through both home delivery and Kiosk sales at around 40 cents for a 20 litre can.

*Annex 6: Case Study of Durban City- Inclusive City-wide water Supply in eThekweni, South Africa*⁵³

Overview: eThekweni Metropolitan Municipality (EMM) lies on South Africa's eastern seaboard, and is home to Durban, South Africa's third biggest city. In eThekweni Municipality, a single water utility provides water and sanitation services across the entire municipal area. There is no evidence of private water services providers.

eThekweni Municipality Water and Sanitation (EWS) is a ring-fenced municipal department with a mandate to provide water and sanitation services in all areas falling under eThekweni Metro Municipality, including all rural and informal settlements.

eThekweni sources 98percent of its water, treated, from the regional bulk supplier, Umgeni Water. In the year to June 2017, EWS supplied on average 817 Ml of water per day from 10 potable water treatment works through 268 water reservoirs, over 14 000 km of water mains and 550 000 registered water connections. It treated just over 500 Ml per day of wastewater in 27 wastewater treatment works connected to over 8 000 km of sewer lines. It employed 3 672 full-time staff in April 2018.

Approach: EWS has earned international recognition and acclaim for its achievements in expanding access to good quality water and sanitation services. Its methods and results are cited widely as an example to others worldwide facing similar challenges. Access to water across the entire municipal area is near universal (about 97percent), mostly continuous, and safe and pleasant to drink from the tap - even if it is not necessarily piped to the premises. An estimated 74percent of the population has an authorised piped water connection on the premises.

Key features of its approach include the following:

- A strong emphasis on trying to understand its customers' needs, and developing a range of measures and service options to support affordability
- EWS aligns the level of water services with the feasible sanitation technology, and offers differentiated service levels: This integrated approach to water and sanitation services is designed to address health, hygiene and pollution management comprehensively.
- In formal settlements, yard or house connections are paired with waterborne sanitation or septic tanks.
- In informal settlements, free-standing public standpipes and water dispensers are steadily being replaced by sewer community ablution blocks (CABs) which provide water points, showers, laundry troughs and flush toilets. Used water and sewage is collected and drains to a nearby sewer main, and development of the water and sewer infrastructure to serve these ablution blocks is laying the basis for comprehensive upgrading of each informal settlement in due course.
- In rural areas, beyond a notional urban development line where settlement densities are lower, EWS provides and installs an on-site urine-diversion dry toilet and a system for delivering 300 litres of water, free, per household per day. Those wanting a flush toilet are able to upgrade at their own cost, provided they install a septic tank. Plot sizes allowed all used water to infiltrate and be absorbed on-site, limiting run-off of contaminated water and avoiding the need to develop sewer infrastructure.

⁵³ Case study summary prepared by Kathy Eales, Consultant to the World Bank for CWIWS, June 2018

- All water supplied from public water points is provided free, and low-income households – identified by using the rates value of their property as a proxy – receive 6 kls water free each month. The cost is offset by cross-subsidies through a 5-part rising block tariff, and by significant transfers from national government to the parent municipality. External subsidies made up 17.5percent of the EWS budget in the financial year to June 2017.

Private providers

National sector legislation discourages the use of private providers. Nonetheless there is evidence of informal private sellers in other South African municipalities, including those adjacent to eThekweni, and anecdotal evidence suggests that the incidence of informal private provision is growing nationally as the reliability of municipal provision deteriorates. It seems most are selling potable water sourced from the municipal supply, at a rate below the local municipal water tariff.

There appears to be very limited current demand for alternative service providers in eThekweni because the networks are extensive and reasonably well-maintained, and most unscheduled water outages are resolved within 24 hours. Water is currently available 24/7 across about 85percent of the municipality, and substantial improvements are expected in most of the remaining areas by the end of 2018 when link in a major new pipeline is completed. EWS providers supplementary tankering at no cost to customers in some areas to safeguard an adequate supply of water to all. Over half the population receives 6 kls of water free per household per month as a matter of policy, with some receiving considerably more for free through unauthorised connections. These factors limit current demand for private services substantially.

Key challenges in eThekweni: About a quarter of eThekweni’s population lives in informal settlements and providing adequate services is one of the most intractable challenges. Government has taken on the responsibility of providing modest free housing with full title and electricity, water and waterborne sanitation to all low-income families who need it, but delivery of new formal housing lags far behind demand. Provision of interim services in informal settlements is now likely to be necessary for far longer than envisaged, raising significant questions around the type of services and facilities provided, their management and funding.

Densification in many low income formal townships is putting extreme strain on infrastructure designed for far smaller populations. This is most evident in sewer blockages, spills and pollution. The willingness of traditional authorities to accommodate unregulated development of houses in areas designated as rural is challenging the municipality’s spatial development, infrastructure planning and service delivery strategies, as many areas designated as rural – especially in the south and west – are increasingly indistinguishable from urban areas, with high settlement densities now warranting sewered sanitation.

Water delivery systems in former rural areas, intended to support limited household consumption, are now being tapped by affluent users in non-cadastral areas, in a context where cadastral information, with street names and stand numbers, is a pre-requisite for the municipality’s metering and billing administration. This makes metering and billing extremely difficult.

Despite strenuous efforts to reduce Non-Revenue Water below the current estimated 37percent, real losses remain stubbornly high, with an average Infrastructure Leakage Index (ILI) of 8 across the municipality. One reason, is ageing infrastructure, in a context where finite resources have been used to prioritise

provision of new services over maintenance and renewal of existing networks. Another is extensive illegal connections, with irregular joints damaging the integrity of the network.

NRW cost eThekweni over USD 50-m in 2016/17, while rising water demand will require massive new investment to augment supply. With the distinction between free basic water and free water increasingly blurred, will the municipality be able to continue subsidising water to the extent required to ensure affordability to all?

Annex 7: Case Study of Port-au-Prince, Haiti- Private Service Providers Monopolize and Exploit⁵⁴

The urban area of Port-au-Prince is officially designated as “Metropolitan Area” of Port-au-Prince (RMPP). It hosts an estimated 2,620,000 people (665,000 households) and is still growing as more people are leaving rural areas. This extension became stronger after the Quake of 2010 and the following cholera outbreak.

The core urban area is a puzzle of slums and more formal areas. The urban slums are easy to distinguish from their anarchic organization, but they are often ancient, so they cannot be considered as “rapidly urbanizing”. An estimated 1,600,000 inhabitants live in these areas, representing 59percent of the population. The slums are still densifying with time, but the expansion area of the city is now located north, in an area known as “Canaan”, designated by the authorities as a potential urban development area just after the quake of 2010. A large number of people (estimated 300,000 people in 2016) settled there informally. There are other such areas that can be considered as “Rapidly urbanizing”, but Canaan is the biggest and represents quite well all the issues of this type of areas.

The “rural interface” of RMPP represents officially 96, 000 persons who live in the heights of the mountains surrounding the city. But apart from population number there is little data available for these areas. Due to their mountainous aspect, they are difficult to access and have little relation with the urban area. Life there is rural by all points of view.

In 1964 was created the first public utility for Port-au-Prince (CAMEP, today called “Centre Technique d’Exploitation de la RMPP”, or CTE RMPP). But already back then the city was expanding so quickly that investments could not meet the demand. Today, the volume of water produced (1,600,000 m³/day) covers only half of the needs of the city. The network is very old and would need huge investment to tackle water losses (estimated 50percent). It fails to reach several areas of the town, especially the highest ones, and slums. The average service availability is 26 hours per week.

The coverage of distribution pipes is low, representing 45,000 connections in 2011. A number of 10,000 illegal connections was reported in the same year, but the CTE claims that this number has reduced after specific interventions, and that these connections turned into legal ones. Thus, the official figure for 2018 is 55,000 connections. The price per m³ is 0.25 USD.

Thus, since 1970 at least, households of Port-au-Prince are in search for alternatives, but the hydrogeological context offers little options like wells or springs. The most common alternatives are mostly from private sector: *67percent of inhabitants rely on private suppliers for water either for drinking, domestic purposes, or both*. Water service is actually operated by 2 or 3 businesses (one for production, one for transport, one for distribution). The most common options are:

- (i) **Public standpipes** (in slums only, 0.31 to 0.95 US\$/m³, uncertain quality). Since 1995, a French NGO called GRET and the National Directorate for Water and Sanitation (DINEPA) pushed for a hybrid service than could reach slums that the public utility was unable to serve. On each designated area, the utility supplies water to one cistern through one bulk meter managed by a local committee, considered as a unique client. The committee then sells water to slum dwellers per bucket through public standpipes. This solution received continuous support from funders and around 2012 it virtually supplied water to 800,000 people in 50 slums and was considered a great success. However, it suffered from the quake and still suffers from the degradation of water availability from public utility, in such a way that it now covers only a fraction of the population’s needs in slums.
- (ii) **Neighbour resale** (4 to 8 US\$/m³, low water quality), which was the most common way of getting water in RMPP in the 1990’s. The number of connections to the utility was then limited, and buying a tank was very expensive at that time. The “happy few” who could store water were then solicited for help and sold water for profit. Today most

⁵⁴ Case Study Summary prepared by Bruno Le Bansais, Consultant to the World Bank for CWIWS, June 2018

water resellers buy bulk raw water from freelance truck drivers (an estimated 1400 of them are active in the city), who buy for themselves from borehole operators located in the plain north of Port-au-Prince (“Cul-de-Sac”). A minority of tank owners still use water from CTE network, sometimes illegally. There are around 12,500 tanks used for neighbour resale in all areas of the city. More than 10,000 households use it as their main source for drinking water.

- (iii) **Private kiosks** (29.1 US\$/m³, good quality): There are around 2000 private kiosks in the city. They are operated by independent resellers who buy treated water from borehole operating companies (distinct from raw water borehole operating companies, but located in the same plain) and fill user’s buckets or sell per returnable plastic containers. 4 companies (out of more than 100) provide water to 80percent of these kiosks. The booming of private kiosks happened after 2010 and the cholera outbreak, as most inhabitants feared that water from CTE or raw borehole water would be infected. *Water from kiosks is trusted as a treatment device is often installed within the kiosk*, where customers can see it, even if water is already treated by reverse osmosis by borehole operators. At least 300,000 people use this solution as main source for drinking water, but this figure dates from 2012 and has certainly more than doubled since then if we consider the recent increase in the number of kiosks.
- (iv) **Bottled water** (52 to 104 US\$/m³, good to uncertain quality): there would be around 50 bagged water producers in town, with three companies representing 75percent of the market. They all use water from boreholes located in the plain north of the city. The bags are usually of 0.3 liters size and sold to wholesalers in sacks of 60 bags. The distribution is made through around 6000 streets resellers and 300 shops. The most renewed company is Culligan, which claims a perfectly potable quality thanks to elaborated treatment. The other companies mainly produce water in small bottles or plastic bags (sachets) with variable quality, but no control.

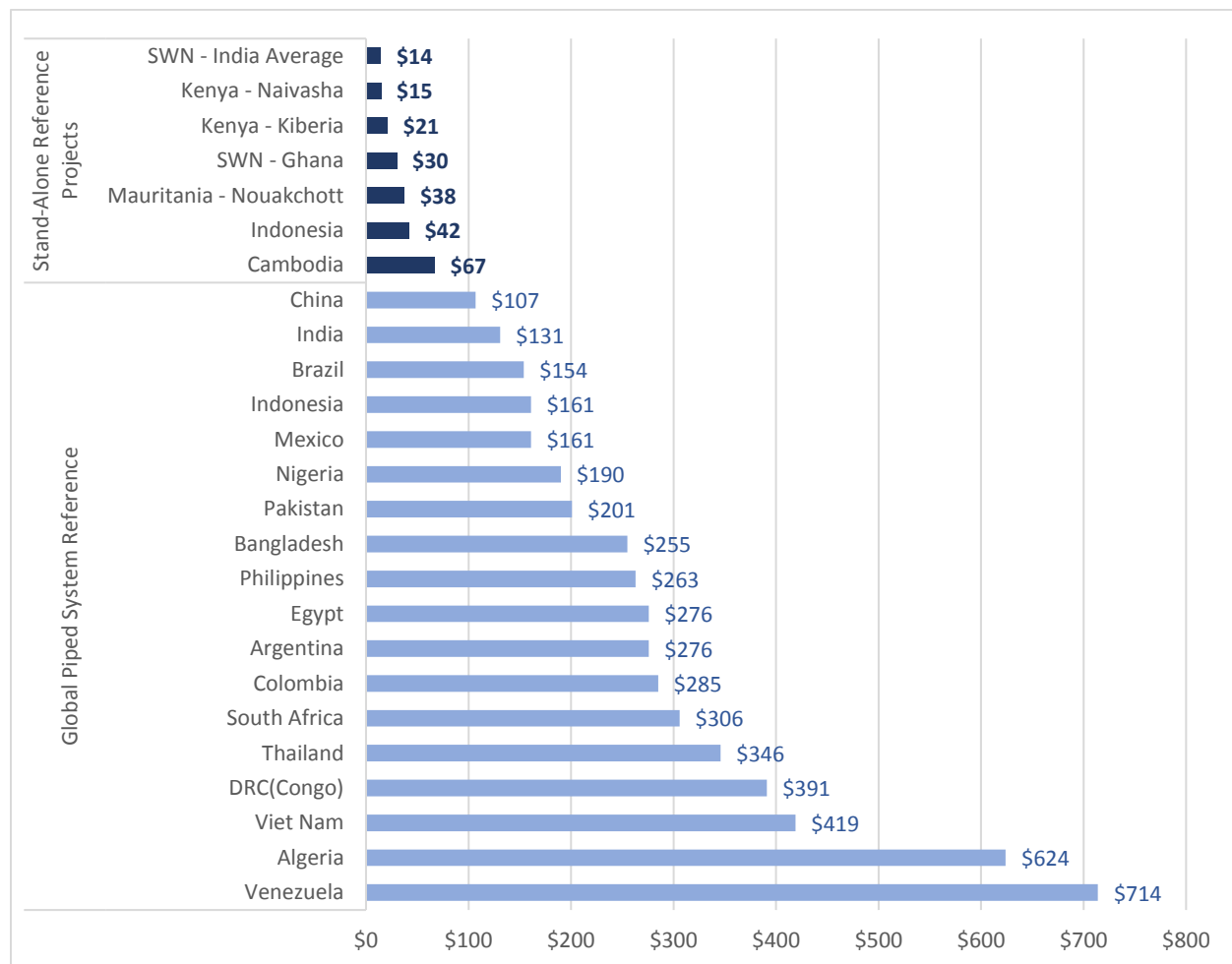
The 2009 Framework water law gives DINEPA the capacities, among others, to “regulate the provision of water supply services”, “approving tariff schemes” and “granting operating permits”. This doesn’t result into any formal activity targeting independent suppliers. The only example of collaboration with the private sector happened in 2010 during emergency responses to the earthquake and to cholera outbreak, when tankers were contracted by the government to deliver water to IDP camps.

The Ministry of Health (MSPP) and DINEPA are jointly responsible for quality standards for drinking water. However, these standards are not yet officially set. The Ministry of Commerce and Industry (MCI) did organize quality control operations between 2012 and 2014 in treatment plants of bottling and bagging companies and in kiosks, as part of his mandate to protect customers. However, it did not result in active regulation of these producers. The public authorities appear to be helpless in front of private sector. In 2012, a tentative attempt to ban the sale and use of polyethylene bags in order to protect the environment had to be cancelled due to active resistance from private actors.

This absence of regulation has worrying consequences for resource protection. There is no active regulation system of borehole operating companies either. The Ministry of Environment (MDE) is formally responsible for groundwater control and preservation since 2006, and therefore to grant drilling and water abstraction permits. But in practice this system is inactive as the MDE has no capacity to enforce regulation. All borehole operators abstract water from the same overexploited aquifer. This same resource is also used by CTE for 60percent of its production (the rest coming from springs), farmers and industries. There is no regulation of abstractions, and overexploitation results in saline intrusion that is likely to worsen.

Annex 8: A Range of Capex Costs for Piped and Off-Grid, Stand-Alone Water Systems

Figure 23: Capex Costs, Fully Piped Water Supply Projects, and Off-Grid Stand-Alone Water Systems



Sources: Dalberg, <https://www.untapped-inc.com/safe-water-enterprises.html>; Hutton and Varughese 2016; SWN India sector studies in India and Ghana.

Note: Piped Supply references for countries with greater than 25 million urban population. capex = capital expenses; SWN = Safe Water Network.

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