



Mobile Enabled Community Services



Sizing the Opportunity of Mobile to Support Energy and Water Access

Michael Nique, GSMA



Mera Gao Power (MGP) minigrid installation in the Sitapur District, Uttar Pradesh, India. This low wattage solar system can cover more than 30 households with basic lighting and phone charging solutions at an affordable price for the community. June 2013.

Executive Summary

Mobile connectivity has grown beyond the reach of the electricity grid and piped water networks in most emerging markets. Since 2000, the slow growth of energy and water access (between 1 and 2% per year¹) compared to the rapid expansion of GSM mobile networks (11% per year), has widened the gap between access to mobile and access to utility services especially for underserved populations.

As of 2012 for urban and rural locations, electricity access was estimated at 91% and 63% respectively² and for improved water access at 95% and 79%³. In comparison, GSM coverage is reaching up to 84% of the population living in developing countries⁴. In cities, most of the population is now covered by GSM networks (~97%⁵) whereas in rural locations, around 72%⁶ of the population has mobile coverage.

The GSMA's Mobile-enabled Community Services programme supports the mobile industry in its distinctive position to help solve the challenges of extending access to energy and water services in emerging markets. The size and the reach of the industry's infrastructure, distribution channels, mobile payments and technologies offer innovative pathways to achieve reliable energy access and increased water access for underserved communities.

This document, which is the first paper in a series of three that will be published in the coming months⁷, outlines:

- The size of the addressable markets for mobile-enabled energy and water services by regions;
- The mobile channels that support access to improved infrastructure services.

An “addressable market” is defined as the number of people who live within range of GSM networks and currently have no access to the electricity grid or access to improved water sources. The GSMA estimates that:

- The total addressable market for mobile-enabled energy access is more than 643 million people in 2013 or 53% of the global population without access to the electricity grid (~1.2 Billion people);
- The total addressable market for mobile-enabled water access at approximately 262 million people in 2013 or 34% of the global population without access to improved water sources (~780 million people).

¹ International Energy Agency (IEA) 2012

² Ibid

³ WHO/UNICEF JMP 2012

⁴ GSMA 2013 for a list of 114 countries (representing ~95% of the population living in developing countries)

⁵ GSMA MECS 2013

⁶ Ibid

⁷ Two other reports to be published in Q1 2014 will provide more in depth regional information on institutions and entrepreneurs leveraging mobile technologies in Africa and Asia

Update on Mobile Enabled Community Services Activities

This is the first major research publication from the Mobile Enabled Community Services programme. As a new take on the predecessor programme Community Power for Mobile, jointly with the UKAID, the Mobile Enabled Community Services programme was established to support the mobile telecom sector leverage its capabilities and assets to provide improved energy and water access to underserved areas in developing markets.

Over the past four years since the concept of mobile enabled energy services was first being investigated within the GSMA, we have seen it grow from an abstract concept to viable commercial solution. However, it's still at an embryonic stage and several challenges still exist, such as the need to have tried and tested business models, access to information on the sector and technical support and a channel for engaging partners like mobile network operators, which need to be addressed in order for the industry to flourish.

Designed with these challenges in mind, the Mobile Enabled Community Services programme comprises of initiatives aims to increase knowledge sharing across and within markets, conducts market research, provides technical assistance and distributes up to £2.4 million in grants to fund innovation from seed stage to market validation.

Since the programme kick-off in early 2013, the Mobile Enabled Community Services team has conducted two Working Groups, one in May in Africa and one in June in Asia, to bring together the industry stakeholders to share knowledge on their respective markets and ongoing initiatives. The first round of our Innovation Fund was also completed in October; out of the 80 concept notes received, [four grants were ultimately awarded to energy and water innovators](#) by an independent panel of evaluators. For the second round (which results will be announced in December), more concept notes were received, confirming the role mobile technologies could play for innovators in this space.

This report “Mobile-Enabled Community Services – Sizing the Opportunity of Mobile to Support Energy and Water Access” is the first of many reports and case studies to be released within the current scope of the programme and lays the foundation of the sector. The research provides a snapshot of the size and opportunity of the market across regions for both energy and water access. It should serve as an indicator of the potential and scale of the opportunity to the organizations currently active or planning to be involved in the sector.

I trust that you will find this report both educational and informative.



Areef Kassam,
Programme Director,
GSMA Mobile Enabled Community Services Programme

Snapshot on Energy and Water Access in 2013

Innovative energy solutions are needed to keep up with the off-grid population growth

According to the recent SE4All Global Tracking Framework⁸ published in 2013 by the World Bank, 1.2 billion people don't have access to electricity and 2.8 billion have to rely on wood or other biomass fuels to cook and heat their homes. About 80% of those without access to modern energy today live in rural areas.

If 1.7 billion people gained access to electricity between 1990 and 2010, this is only slightly ahead of the population growth of 1.6 billion over the same period. In order to reach universal, affordable and sustainable access to energy by 2030 (as stated by the United Nations), there is a need to accelerate the pace of expansion to keep up with this demographic growth.

"Building out a national electricity grid has historically been a successful strategy for achieving high rates of energy access in many countries, but it is not as well suited to serving sparsely populated or remote areas. Such solutions require business models that are commercially viable, entrepreneurial supply chains that can reach remote areas, increased consumer acceptance, community-based service delivery models and innovative financing mechanisms."

A Vision Statement – Sustainable Energy for All, by Ban Ki-moon, Secretary General of the United Nations – November 2011

On a short time scale, there are strong opportunities for off-grid communities to have access to sustainable energy through stand-alone mini-grids and individual household solutions such as home solar systems. The cost reduction of renewable energy sources in recent years (PV module prices have fallen by 80% since 2008 and by 20% in 2012 alone⁹) added to more collaborative actions and increased knowledge on mini-grid best practices are paving the way for further deployments. The presence of off grid mobile towers, providing mobile coverage and enabling mobile services for the off grid communities and service providers, can support the provision of decentralized energy products and services (the 5 mobile channels supporting these energy services are presented in Appendix 3).

Increasing clean water access and ensure water security

According to the 2012 report on Progress on Drinking Water and Sanitation published by the World Health Organisation and UNICEF, between 90 and 98% of the inhabitants in emerging countries have access to an improved water point¹⁰, with varying disparities between rural and urban areas. India and China have experienced remarkable growth in terms of access to water over the past 20 years and almost 50% of the 2 billion people who have gained access to improved water points since 1990 live in those countries¹¹.

Even though the Millennium Development Goal 7 on halving the number of people without access to clean water by 2015 has been reached last year, there are still today more than 783 million people around the world lacking access to a safe source of water. Questions are also raised about the security and sustainability of the water systems built in recent years where proper maintenance schemes and community ownership of these systems are lacking. A study by UNICEF in 2007 indicated that about 40% of the hand-pumps (about 150,000 of the 350,000 installed at the time) in Africa were no longer in working order¹². Without adequate maintenance and technical support services, most hand-pumps had a limited functional life of 3 to 5 years¹³.

Adding to the goal of providing universal access to clean water solutions, there is a need to ensure current water infrastructure and services are reliable. Using different mobile channels such as the use GSM Machine to Machine communication to monitor water pumps remotely, or mobile micro-insurance to sustain water services for unbanked communities, can catalyse the development of more transparent and responsive services for the communities often lacking access to formal energy, banking and water

⁸ <http://www.worldbank.org/en/topic/energy/publication/Global-Tracking-Framework-Report>

⁹ World Energy Finance/Bloomberg 2013

¹⁰ As defined by WHO/UNICEF JMP: an improved drinking-water source is defined as one that, by nature of its construction or through active intervention, is protected from outside contamination, in particular from contamination with faecal matter

¹¹ <http://www.emag.suez-environnement.com/en/access-water-sanitation-emerging-countries-7455>

¹² <http://www.fairwater.org/products/projects/funding-was-used-on-non-sustainable-water-pumps.html>

¹³ *Ibid*

infrastructure.

Mobile-Enabled Community Services Regional Opportunities

This section presents the estimated addressable markets for mobile-enabled access to energy and water services in the following regions: Sub Saharan Africa, Middle East and North Africa, Europe and Central Asia, South Asia, East Asia and Pacific & Latin America and the Caribbean.

Methodology

The total addressable market is an estimate of the number of people living within range of GSM networks and who have no access to electricity or water, and so could be directly impacted by the deployment of mobile-enabled services. This estimate is based on the latest available data on (see Appendix 1 for more information on the methodology):

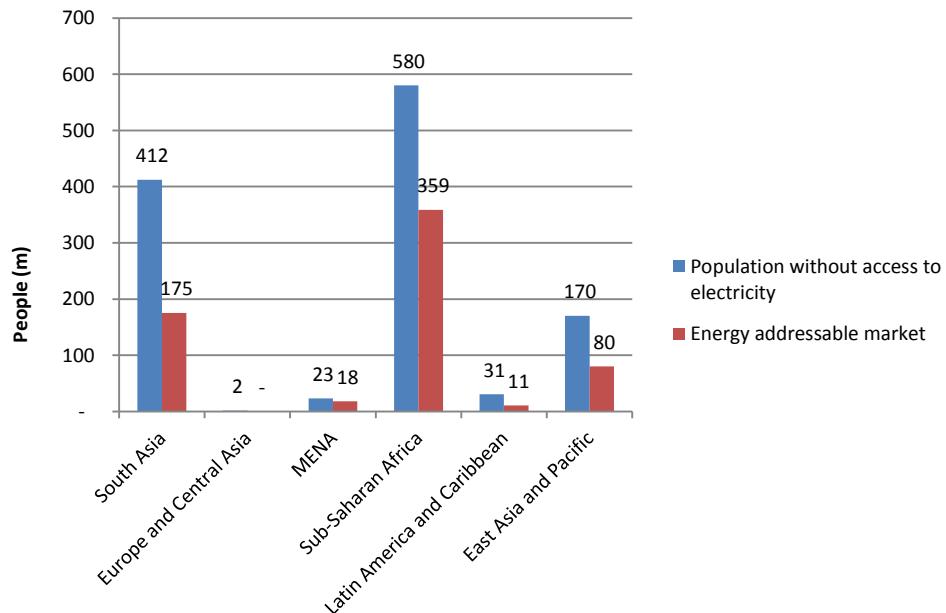
- Access to electricity (% of population) (World Bank Global Tracking Framework 2013);
- Access to an improved water source (% of population) (WHO/UNICEF Joint Monitoring Programme 2013)
- Percentage of the population covered by GSM networks (mobile operators and GSMA).

Addressable markets could be even larger than the ones presented below as we do not consider the population already connected to the electricity grid, but where the power supply is highly unreliable, or the population with access to piped water networks with intermittent supply. These populations could also benefit from mobile-enabled services to increase the reliability of their utility services.

Energy-addressable Markets

As of mid-2013, the GSMA estimates a total energy-addressable market of more than 643 million people, which represents up to 53% of the global population without access to the electricity grid worldwide. Out of this total, more than 476 million people (74% of the total) live in rural areas.

Figure 1 – Energy-addressable markets by region in 2013 (million people)



Source GSMA, IEA

From a regional perspective, the largest addressable market is Sub Saharan Africa (359 million people) where the reach of electricity networks remains limited (~32% of the population¹⁴) but where mobile networks cover more than 74% of the population. In East

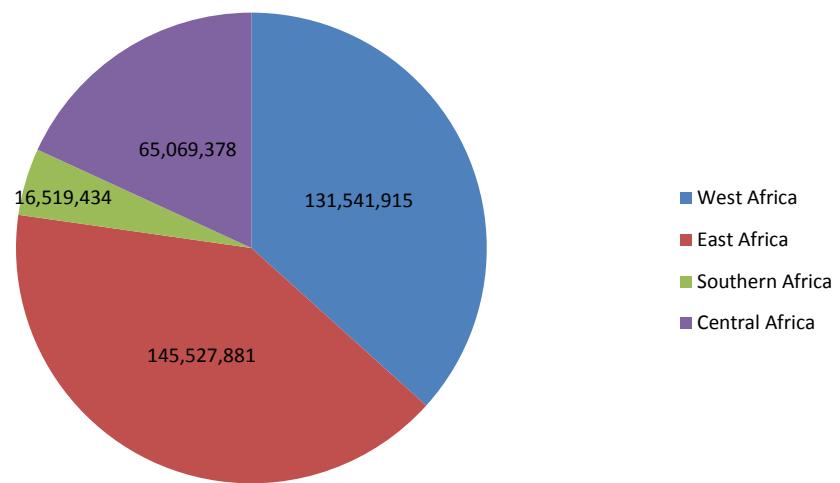
¹⁴ International Energy Agency

Africa, Kenya, Tanzania and Uganda accounts for more than 82 million people who could benefit from the access to mobile-enabled energy services; in West Africa, Nigeria is dominant with an addressable market of approximately 59 million people. In Asia, India (85 million), Bangladesh (61 million) and Indonesia (41 million) are the largest estimated markets. In Latin America, Haiti and Peru have respective addressable market sizes of 5.9 and 2.9 million people.

Off-grid solutions in Bangladesh

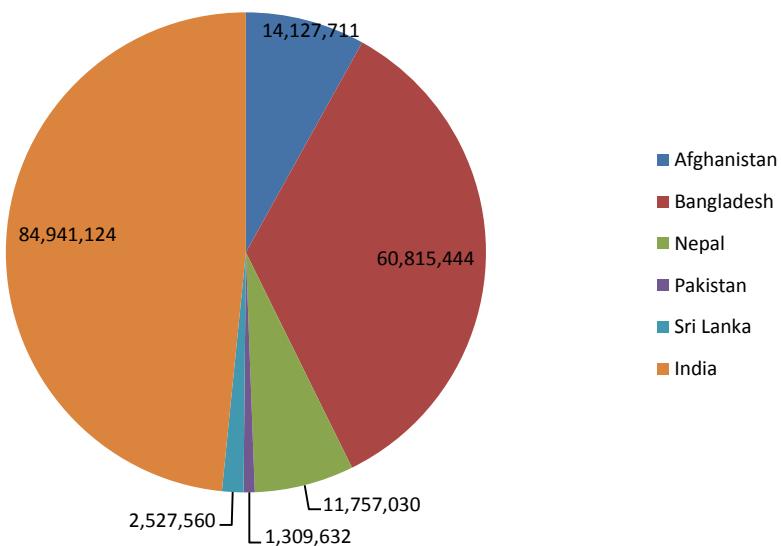
With an electrification rate of ~55% (2013) and a large majority of its population living in rural areas (~72%), Bangladesh has one of the largest addressable markets with 61 million people who could benefit from mobile-enabled energy services. The Bangladeshi government has instituted a strong programme to improve rural electrification through the distribution of home solar systems combined to well-organised micro-credit schemes: as of August 2012, the Infrastructure Development Company Limited (IDCOL) had installed 1,655,832 systems with average installation rates of 80,000 per month. Mobile networks, covering the majority of the off grid population and households already benefiting from the IDCOL programme, could support the scaling up of such programme but also create new opportunities for the private sector.

Figure 2 – Energy-addressable markets in Sub-Saharan Africa (by population)



Source GSMA

Figure 3 – Energy-addressable markets in South Asia (by population)

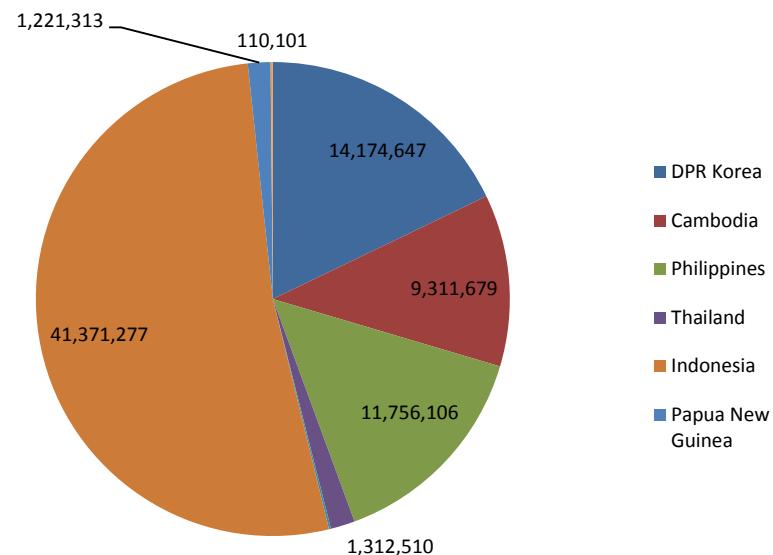


Source GSMA

Increased access to electricity in Pakistan but important load shedding problems

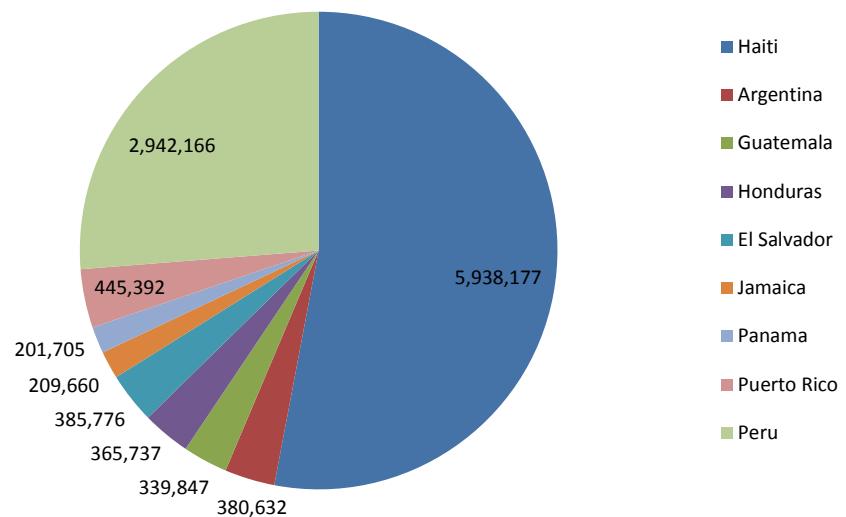
According to the World Bank report on “Sustainable Energy for All - Global Tracking Framework”, Pakistan has made important progress in electrification over the past two decades, with now 91% of the population having access to electricity. However the situation remains challenging for millions of Pakistani, as there are still important power deficits and constant load shedding. A recent online survey conducted by the local Express Tribune, found that a vast majority of regions are facing more than 10 hours of load shedding daily, including Punjab, Balochistan and Khyber-Pakhtunkhwa; even 46% of Islamabad residents reported electricity was not available for more than 10 hours per day. The development of low cost smart meters and prepaid mobile payments could be part of the solution for utilities to optimize their operations and increase payment efficiency, while reducing theft.

Figure 4 – Energy-addressable markets in East Asia and Pacific (by population)



Source GSMA

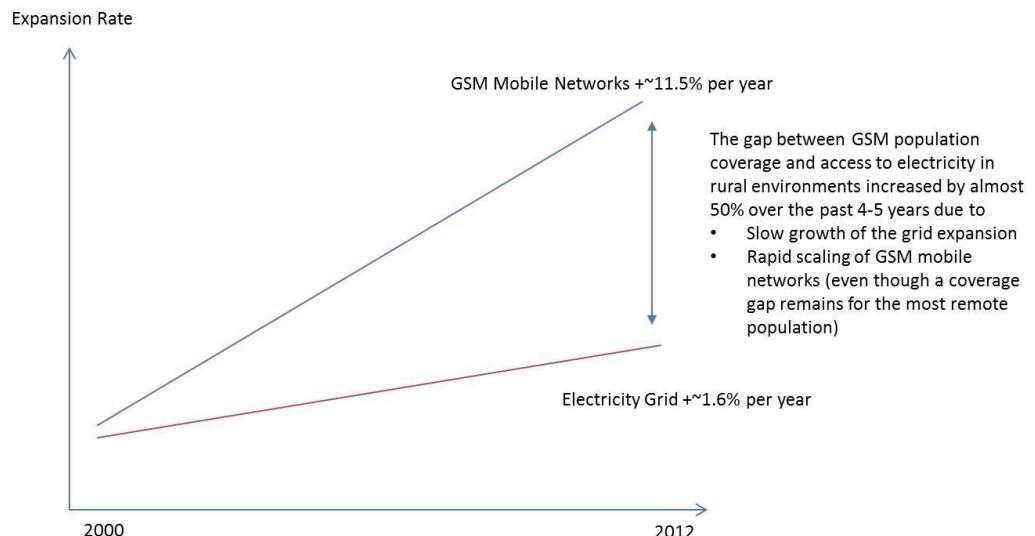
Figure 5 – Energy-addressable markets in Latin America (by population)



Source GSMA

Compared to our previous estimates on addressable markets (2011-12), these new data show that the slow growth of energy and water access (between 1 and 2% per year¹⁵) compared to the rapid expansion of GSM mobile networks (~11% per year over the last 10 years) mainly in rural locations, has widened the existing gap between access to mobile and access to utility services as suggested by the figure below¹⁶.

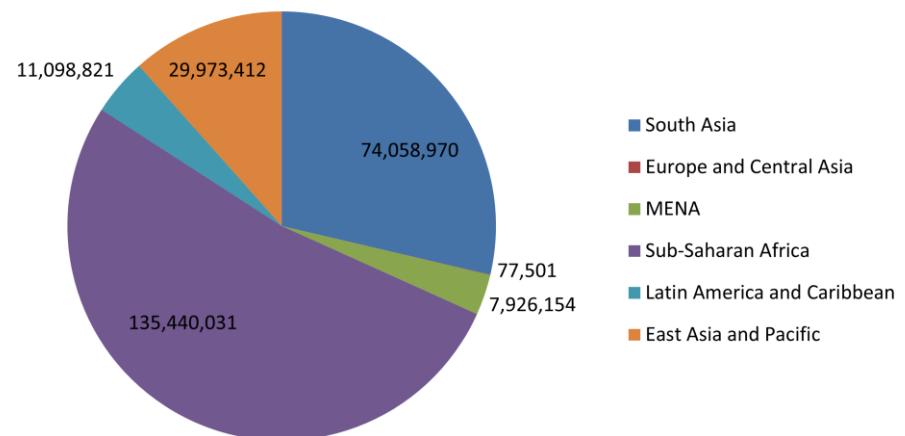
Figure 6 – Expansion rate of GSM networks versus electricity grid worldwide (2000-2012)



Source GSMA

Number of Off-grid subscribers per region – this represents the total number of mobile users, with at least one mobile subscription, living off-grid. We estimated this total at more than 259 million off-grid subscribers mid-2013, segmented regionally as below:

Figure 7: Off Grid Mobile Subscribers in mid-2013 (by population)



Source GSMA

Having access to a local affordable energy solution for these off-grid subscribers would improve mobile uptake as the lack of local phone charging solutions prevents extensive usage – the phone charging expenditure can represent up to 50% of a user's mobile expenditure (airtime + phone charging costs – Source GSMA).

¹⁵ Based on global electrification rate growth from 2000 to 2012 (by IEA), access to clean water (UN, WHO/UNICEF) and GSM population coverage (GSMA data)

¹⁶ Ibid

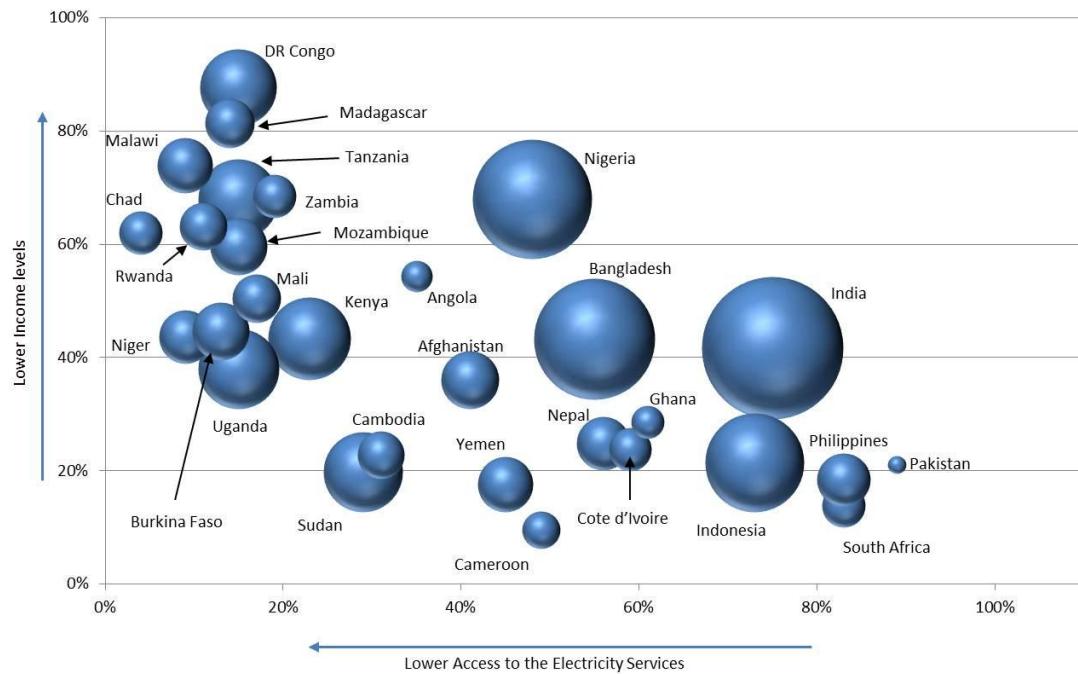
The Poverty Parameter – Affordability of Energy Systems and Services

Low and volatile level of incomes, as well as a lack of access to financial services, are major hurdles to accessing modern energy products and services for a majority of the population living in emerging markets. As mentioned in one of our previous reports¹⁷, the situation for communities living in underserved urban and rural areas is made worse as these markets can be poorly served, dominated by the informal economy and, as such, relatively inefficient and uncompetitive.

Underserved customers, who are already spending a large portion of their income on buying kerosene, candles or charging batteries, can transition to modern energy systems, providing the right distribution channels are in place and solutions are affordable¹⁸. In relation to our energy-addressable market estimates, the proportion of the population living under US\$ 2 per day will be an indicator for energy service providers about the level of attractiveness of a market, based on its population's ability to pay.

The chart below provides information on the level of electrification (x-axis), the proportion of the population living under US\$ 2 per day (y-axis) and the size of the energy-addressable market (bubble). The lower the income level does not mean energy services cannot be afforded, but more importantly will determine the right affordable price point for customers with limited cash. Mobile-enabled services such as Pay As You Go (PAYG) could even be more impactful in poorer markets where the affordability barriers to clean energy solutions are high.

Figure 8 – Electrification rate, poverty levels and size of the energy-addressable markets



Source GSMA

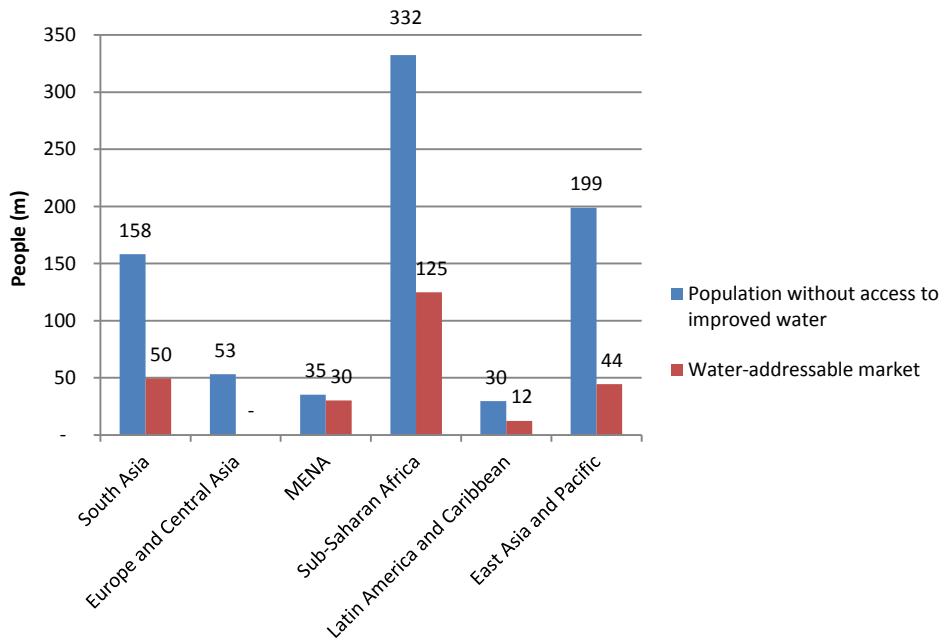
¹⁷ <http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2013/01/Sustainable-Energy-and-Water-Access-through-M2M-Connectivity.pdf>

¹⁸ We define "affordable services or products" as being priced within the household's financial means

Water-addressable Markets

As of mid-2013, the GSMA estimates a total water-addressable market of 262 million people, which represents 34% of the global population without access to clean water.

Figure 9 – Water-addressable markets by region (million people)

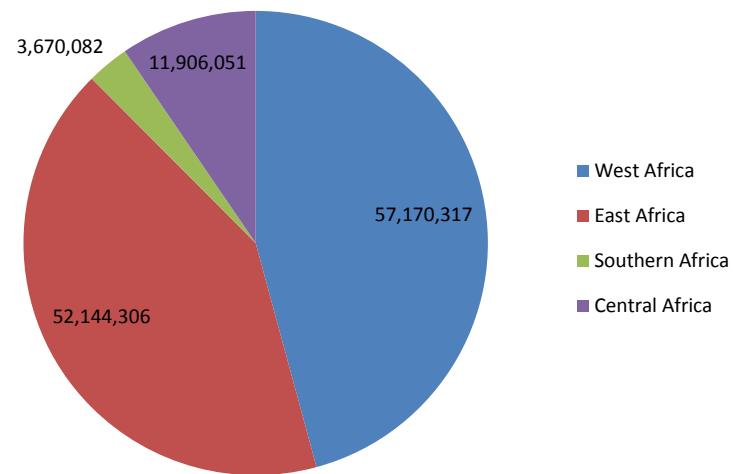


Source GSMA

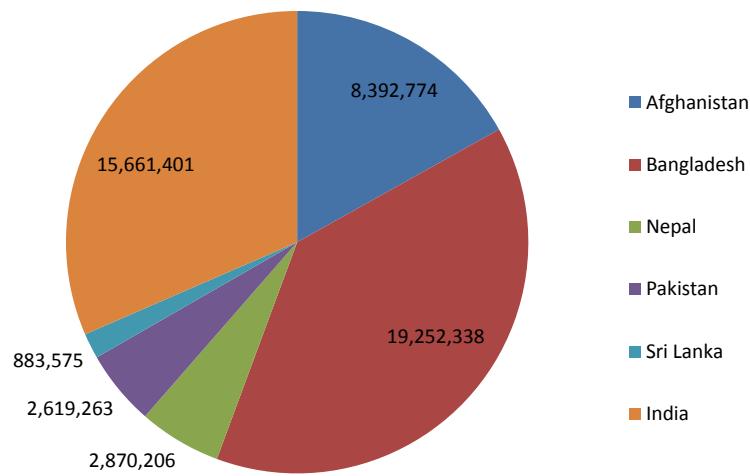
In Sub Saharan Africa, where improved water access has reached 61% of the population in 2012¹⁹, we estimate a water-addressable market of 125 million people. As for the energy-addressable market, Nigeria is the largest market for mobile-enabled water services (38 million), followed by Sudan and Kenya, respectively 16 million and 12 million. In Asia, Bangladesh and Indonesia are the largest estimated markets – close to 19 million people each. In Latin America, Mexico, Haiti and Peru have 3.8, 3 and 2.5 million people respectively who could benefit from the mobile networks presence.

The proportion of the population who can benefit from mobile-enabled water services (in regards to the population without access to improved water) is lower in East Asia and Pacific compared to other regions – this can be explained by the strong improvement of water access between 1990 and 2010 in this region (above 85% in 2012 in rural locations), compared to the limited reach of mobile networks averaging ~78% of the population.

¹⁹ WHO/UNICEF JMP

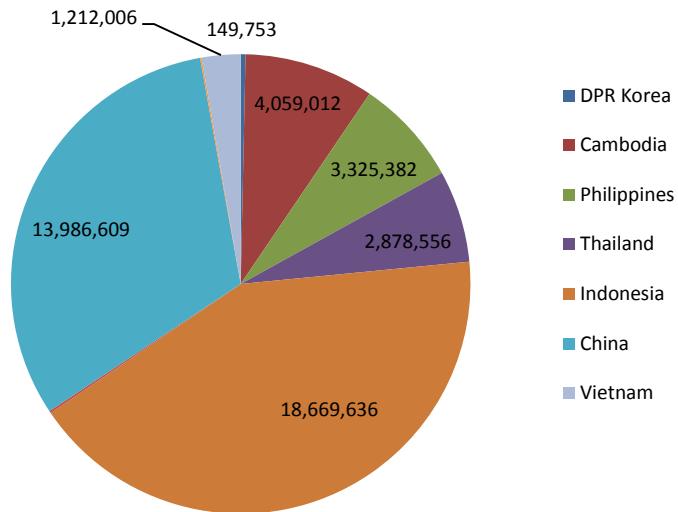
Figure 10 – Water-addressable markets in Sub Saharan Africa (by population)

Source GSMA

Figure 11 – Water-addressable markets in South Asia (by population)

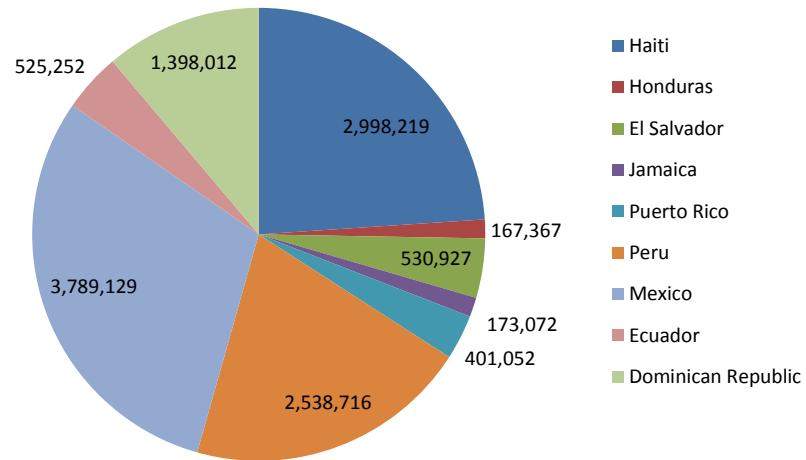
Source GSMA

Figure 12 – Water-addressable markets in East Asia and Pacific (by population)



Source GSMA

Figure 13 – Water-addressable markets in Latin America (by population)

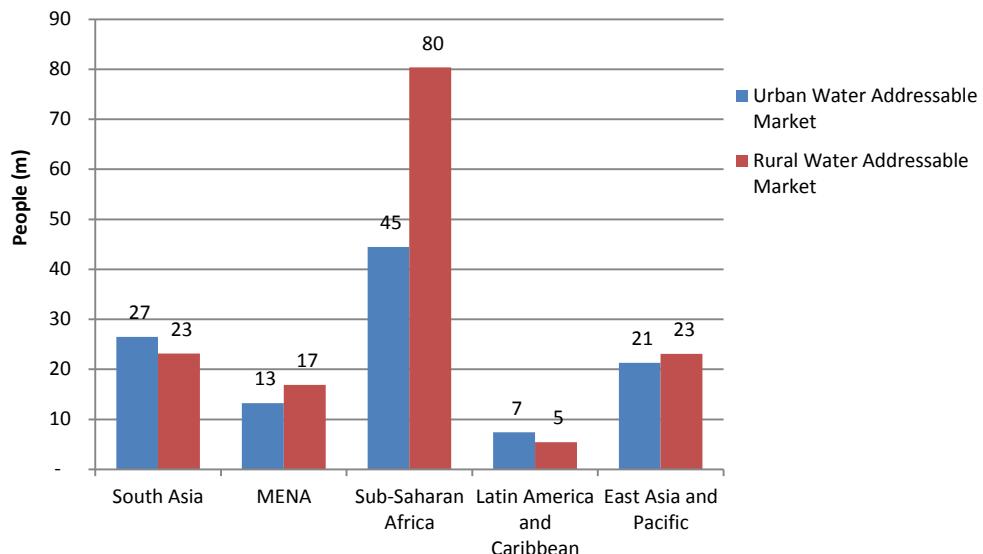


Source GSMA

Out of the total water-addressable market, up to 149 million people (57%) live in rural areas. Compared to the energy-addressable market, a larger proportion of the water-addressable market comes from urban and peri-urban areas where GSM coverage is extensive. A recent UNICEF report²⁰ stated that the number of urban dwellers using unimproved sources increased from 109 million to 130 million between 1990 and 2010 – this must be viewed in relation to the high growth in the urban population over the same time period which rose from 2.3 billion to 3.5 billion people. Overall, the urban opportunity is estimated to be larger than the rural one in South Asia and Latin America, as presented in the chart below.

²⁰ <http://www.unicef.org/media/files/JMPReport2012.pdf>

Figure 14 – Water-addressable markets by region in urban and rural locations (million people)



Source GSMA

The Poverty Parameter – The Price of Water

The UN declared in 2010 that access to clean water and sanitation is a fundamental right, urging the international community to scale up efforts to provide safe, clean, accessible and affordable water and sanitation for all. In underserved urban areas, water can remain scarce, expensive and often contaminated. In countries like India, people will rely on government trucks delivering water, albeit with uncertain routes and schedules, and will pay a higher price to private vendors: the number of people relying on tanker trucks and small vendors for drinking water has almost doubled between 1990 and 2010 from 44 million to 85 million²¹. As a result, clean water, when available, has a greater value due to its scarcity²².

In some countries, endemic corruption is also preventing poor populations from having access to water services. According to the World Bank, 20% to 40 % of public finances worldwide meant for the water sector are lost due to corruption and dishonest practices²³. This corruption can also be translated into paying a higher price to be connected to water networks or pay up to 5-10 times more²⁴ for water than their wealthier counterparts.

The figure below provides information on the level of access to improved water (x-axis), the proportion of the population living under US\$2 per day and the size of the water-addressable markets (bubble). As stated by the JMP²⁵, there are vast disparities between rich and poor populations when comparing access to water – for example in Sierra Leone, the richest quintile of urban population has an almost universal access to water whereas the poorest quintile in rural areas has a 10% improved water access. For the water service providers operating in poorly served areas, covering the cost of provision and maintenance is challenging the provision of reliable and affordable services. Mobile channels such as prepaid solutions, community savings through mobile money channels and/or real time monitoring can be leveraged by water service providers willing to serve the poorest and remote population which does not have access to formal infrastructure.

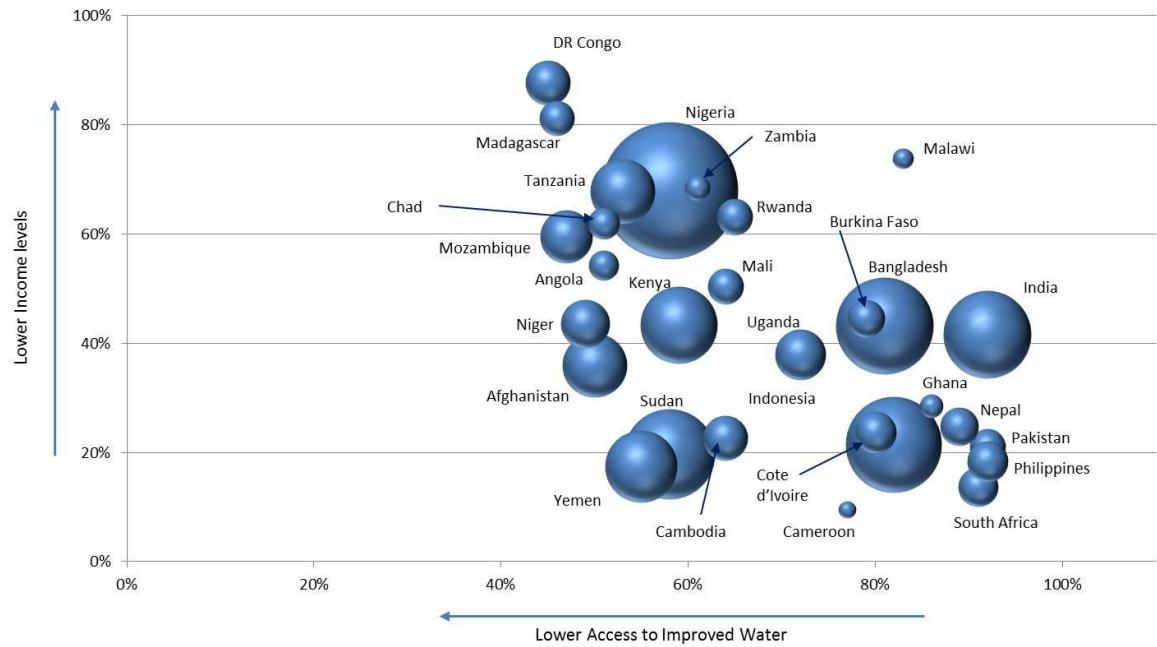
²¹ Ibid

²² http://info2.frogdesign.com/hs-fs/hub/262724/file-273114309-pdf/pdf/frog_Journeys_for_Water.pdf?utm_campaign=sarvajal-journeys-for-water-india&utm_content=10124999&_hsenc=p2ANqtz-8Jmxp58M2a3KeUMMOrTWbarudsP_QcE2_OljRZUuNedfl_tqFWZx38yil1HWfMnK0lAgarnFcmbta2kX5wtoRawQ1g&_hsmi=10124999

²³ <http://www.irinnews.org/report/97642/in-africa-corruption-dirties-the-water>

²⁴ <http://water.org/solutions/watercredit/>

²⁵ WHO/UNICEF JMP Report 2012

Figure 15 – Access to improved water, poverty levels and water-addressable markets

Source GSMA

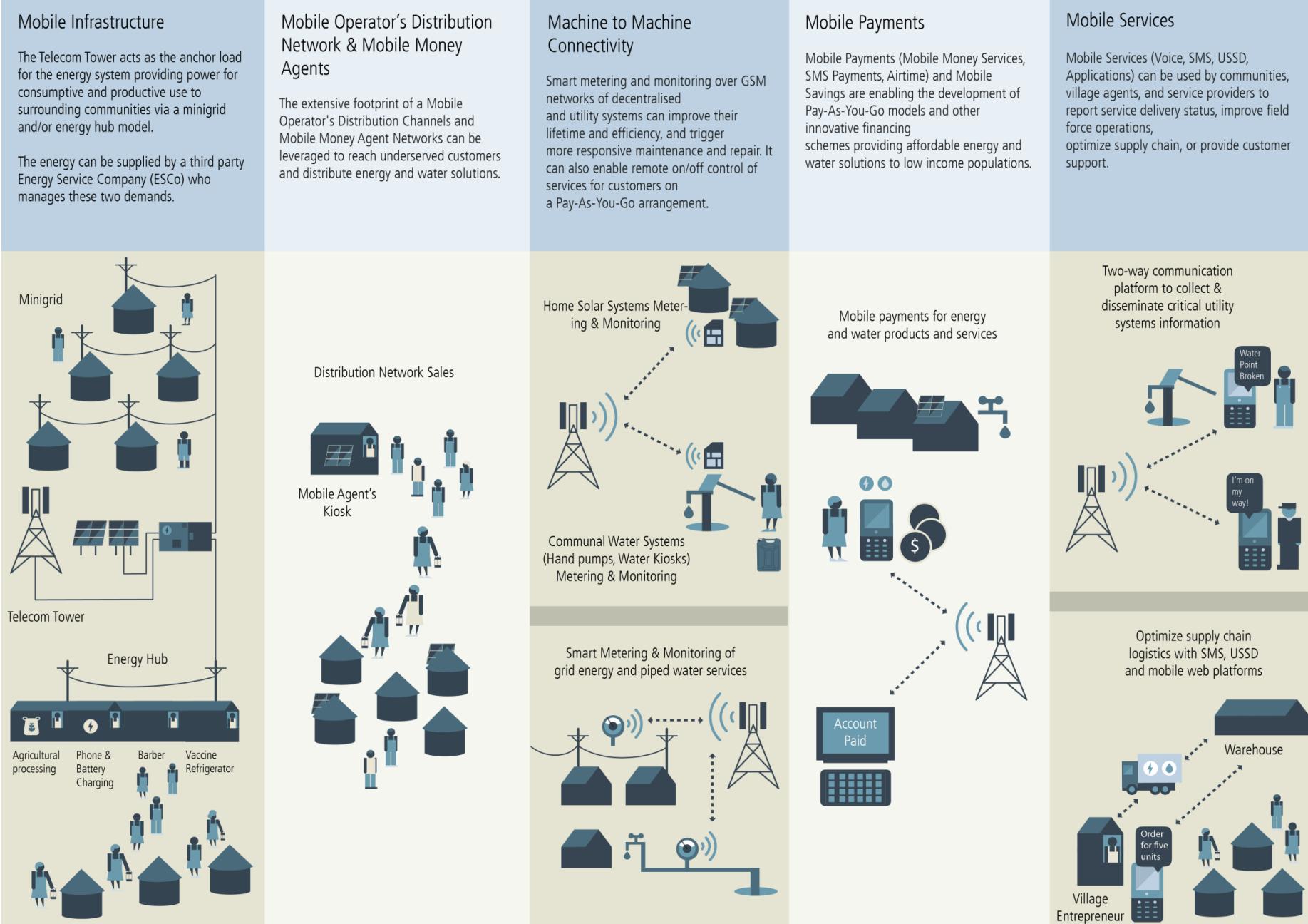
Five Mobile Channels – How the Mobile Industry Can Enhance Access to Energy and Water

Based on the current footprint and maturity of the mobile industry, the GSMA Mobile-enabled Community Services programme envisions that five channels can support better access to energy and water solutions:

- Mobile Infrastructure – Leveraging the presence of telecom towers in off grid environments to support rural electrification efforts
- Mobile Operators Distribution & Mobile Money Agent Networks – Leveraging the footprint and brand of mobile operators to reach underserved customers
- GSM Machine to Machine Connectivity – Enabling the remote monitoring and Pay As You Go capacity of decentralized utility systems
- Mobile Payments – Providing financing and affordable solutions to low income populations
- Mobile Services (Voice, SMS, USSD, Applications) – Leveraging increased mobile phone ownership to collect/disseminate critical information on utility services and/or supply chain management

The graphic below synthetises the GSMA vision of using these five channels to enhance access to energy and water:

Figure 16 – Mobile enabled community services channels to support energy and water service delivery



Appendix 1 – Methodology for the Energy and Water-addressable Markets

The total addressable market is an estimate of the number of people who live within range of GSM networks and have no access to electricity and water, but could be hence impacted by the deployment of mobile-enabled services. It does not represent the number of addressable mobile customers as we are not taking into account age categories or the number of person per households.

For a total of 114 developing countries, the total addressable markets were calculated by overlaying the following data in urban and rural locations on a country basis:

- The percentage of the population with access to electricity and water (2013 from IEA and WHO/UNICEF sources);
- The percentage of the population being covered by GSM networks (the most recent data available from mobile operators and GSMA).

When available, we used the latest mobile operator data on GSM population coverage (from Annual or Sustainability Reports). We also completed this information with data processed by the firm Collins Bartholomew which – based on the mobile operator coverage maps – overlays the population data (coming from census information in different administrative regions) and the geographic GSM coverage data in the same regions. To estimate urban/rural population coverage, our logic is then to move the bulk of the covered population in urban areas instead of spreading it equally across a region. According to the level of population coverage (from 100% to 10% in the 114 countries studied), we are segmenting countries in seven different baskets, ensuring that a majority of the population living in urban areas is covered by GSM networks, without however returning a zero value for GSM population coverage in rural locations (potentially happening for countries with low GSM population coverage).

According to this methodology, the validity of our Addressable markets estimates is also subject to the definition and accuracy of the key data points used:

- Access to Electricity (Sustainable Energy for All World Bank Tracker 2013);
- Improved water access as defined by WHO/UNICEF Joint Monitoring Programme;
- GSM population coverage as reported by mobile operators and GSMA.

Appendix 2 – Energy and Water-addressable Markets by Regions

The tables below list some of the key indicators for our Mobile Enabled Community Services addressable market estimates. When there was a lack of data for a country or when an addressable market is negligible (based on our methodology), we added the sign ‘-’. The countries below are ordered from the largest energy addressable markets to the lowest per regions.

1. Sub Saharan Africa

Country	GSM Population coverage (2013)	Mobile connection penetration (4Q 2012)	Electrification rate (2012)	Energy-addressable market (2013)	Access to an improved source of water (2012)	Water-addressable market (2013)
Nigeria	89%	67%	48%	59,387,894	58%	38,279,799
Kenya	95%	68%	23%	28,398,473	59%	12,118,205
Uganda	97%	42%	15%	27,009,168	72%	5,158,037
Tanzania	76%	55%	15%	26,663,260	53%	8,460,002
Sudan	88%	76%	29%	26,400,408	58%	16,610,764
DR Congo	53%	28%	15%	24,501,157	45%	3,984,972
Burkina Faso	97%	56%	13%	13,769,730	79%	2,834,310
Mozambique	75%	37%	15%	13,628,110	47%	5,656,412
Malawi	95%	31%	9%	12,756,372	83%	853,494
Niger	86%	32%	9%	11,620,831	49%	4,744,197
Madagascar	64%	29%	14%	10,065,897	46%	2,419,551
Mali	80%	88%	17%	9,789,441	64%	2,521,178
Rwanda	99%	47%	11%	9,258,069	65%	2,643,967
Chad	73%	40%	4%	7,786,570	51%	2,009,225
Zambia	80%	79%	19%	7,689,052	61%	1,296,738
South Africa	100%	132%	83%	7,624,989	91%	3,142,219
Cote d'Ivoire	98%	89%	59%	7,565,947	80%	3,479,061
Cameroon	85%	63%	49%	5,851,025	77%	571,330
Guinea	80%	65%	20%	5,583,711	74%	-
Zimbabwe	79%	95%	37%	4,850,898	80%	161,032
Ghana	82%	97%	61%	4,496,116	86%	1,065,834
Burundi	60%	28%	5%	4,489,401	72%	143,589
Sierra Leone	86%	52%	12%	4,342,237	55%	1,631,381
Angola	60%	71%	35%	4,088,251	51%	1,746,190
Liberia	80%	56%	4%	3,031,292	73%	90,881
Senegal	86%	85%	57%	2,818,434	72%	544,353
Benin	64%	88%	28%	2,783,398	75%	228,951
Mauritania	94%	95%	18%	2,541,701	50%	1,366,583
Togo	70%	57%	28%	2,326,797	61%	272,841
Lesotho	73%	58%	17%	1,239,169	78%	52,254
Eritrea	50%	5%	33%	1,157,838	61%	281,008
Botswana	95%	152%	43%	1,044,916	96%	12,475
Gambia, The	93%	126%	31%	1,042,116	89%	82,770
Namibia	89%	120%	44%	1,008,986	93%	8,803
Swaziland	100%	67%	35%	750,475	71%	293,298
Central African Republic	21%	35%	9%	605,462	67%	-
Guinea-Bissau	50%	68%	17%	322,111	64%	-
Gabon	96%	178%	82%	155,263	87%	70,574
Cape Verde	91%	106%	67%	120,158	88%	28,177
Equatorial Guinea	37%	76%	29%	67,210	45%	26,300
Comoros	40%	29%	48%	26,273	95%	-

Ethiopia	10%	24%	23%	-	44%	-
Somalia	20%	41%	29%	-	29%	-
Djibouti	30%	25%	50%	-	88%	-
Mauritius	100%	107%	99%	-	99%	-
Congo	-	100%	37%	-	71%	-

2. Middle East and North Africa (MENA)

Country	GSM Population coverage (2013)	Mobile connection penetration (4Q 2012)	Electrification rate (2012)	Energy-addressable market (2013)	Access to an improved source of water (2012)	Water-addressable market (2013)
Yemen	98%	56%	45%	12,737,728	55%	10,412,701
Iraq	98%	84%	86%	3,725,420	79%	4,917,412
Saudi Arabia	99%	211%	94%	1,166,817	-	700,090
Egypt	100%	116%	100%	480,492	99%	480,492
Oman	95%	178%	94%	97,687	89%	122,109
United Arab Emirates	100%	166%	100%	77,899	100%	-
Bahrain	100%	145%	99%	58,483	-	-
Syria	99%	64%	93%	-	90%	885,329
Iran	81%	132%	98%	-	96%	1,058,118
Morocco	99%	119%	99%	-	83%	4,854,487
Algeria	96%	104%	99%	-	83%	4,254,499
Tunisia	99%	127%	100%	-	-	92,437
Qatar	100%	164%	94%	-	100%	-
Libya	84%	129%	99%	-	-	2,205,646
Jordan	100%	139%	100%	-	97%	157,225
Lebanon	100%	87%	99%	-	100%	-
Kuwait	-	188%	99%	-	99%	-

3. Asia (South Asia and East Asia and Pacific)

Country	GSM Population coverage (2013)	Mobile connection penetration (4Q 2012)	Electrification rate (2012)	Energy-addressable market (2013)	Access to an improved source of water (2012)	Water-addressable market (2013)
India	87%	68%	75%	84,941,124	92%	15,661,401
Bangladesh	99%	70%	55%	60,815,444	81%	19,252,338
Indonesia	95%	114%	73%	41,371,277	82%	18,669,636
DPR Korea	85%	7%	26%	14,174,647	98%	149,753
Afghanistan	77%	61%	41%	14,127,711	50%	8,392,774
Nepal	90%	55%	56%	11,757,030	89%	2,870,206
Philippines	99%	107%	83%	11,756,106	92%	3,325,382
Cambodia	99%	140%	31%	9,311,679	64%	4,059,012
Sri Lanka	95%	105%	85%	2,527,560	91%	883,575
Thailand	97%	118%	99%	1,312,510	96%	2,878,556
Pakistan	85%	68%	89%	1,309,632	92%	2,619,263
Papua New Guinea	33%	28%	15%	1,221,313	40%	-
Vietnam	99%	143%	96%	605,476	95%	1,212,006
PDR Laos	70%	86%	66%	110,101	67%	46,951
Vanuatu	70%	63%	24%	108,845	90%	-
Brunei	90%	156%	100%	78,659	-	3,146
Fiji	52%	107%	56%	55,242	98%	-
Samoa	86%	117%	99%	15,169	96%	4,150
Tonga	96%	88%	92%	10,997	100%	247
Myanmar	11%	5%	29%	-	83%	-
China	90%	82%	99%	-	91%	13,986,609
Mongolia	88%	90%	86%	-	82%	70,439
East Timor	18%	53%	38%	-	69%	-
Malaysia	95%	135%	99%	-	100%	-
Maldives	80%	172%	99%	-	98%	5,865
Bhutan	12%	74%	72%	-	96%	-
Australia	-	133%	99%	-	100%	-
Seychelles	-	104%	29%	-	-	-
Micronesia	-	75%	56%	-	-	-

4. Latin America and Caribbean

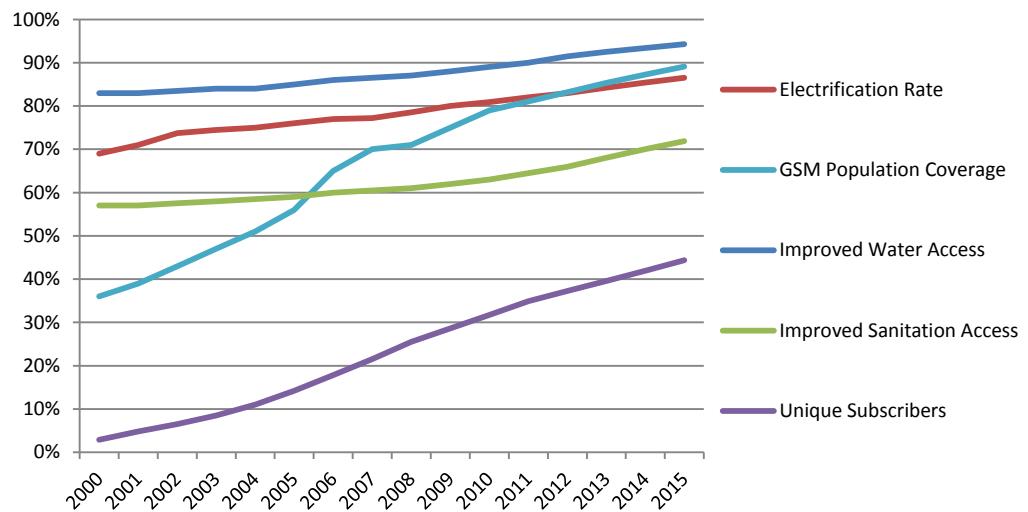
Country	GSM Population coverage (2013)	Mobile connection penetration (4Q 2012)	Electrification rate (2012)	Energy-addressable market (2013)	Access to an improved source of water (2012)	Water-addressable market (2013)
Haiti	95%	63%	34%	5,938,177	69%	2,998,219
Peru	80%	99%	85%	2,942,166	85%	2,538,716
El Salvador	100%	145%	92%	385,776	88%	530,927
Argentina	98%	141%	96%	380,632	99%	-
Honduras	90%	99%	81%	365,737	87%	167,367
Guatemala	88%	104%	82%	339,847	92%	75,771
Jamaica	100%	138%	92%	209,660	93%	173,072
Panama	87%	133%	88%	201,705		86,445
Paraguay	80%	108%	97%	41,753	86%	41,753
Trinidad and Tobago	100%	122%	99%	25,302	94%	86,565
Guyana	43%	85%	78%	9,064	94%	-
Mexico	92%	87%	99%	-	96%	3,789,129
Brazil	95%	133%	99%	-	98%	-
Colombia	80%	100%	97%	-	92%	-
Bolivia	64%	91%	80%	-	88%	-
Nicaragua	73%	100%	74%	-	85%	-
Ecuador	90%	114%	97%	-	94%	525,252
Dominican Republic	99%	92%	98%	-	86%	1,398,012
Cuba	52%	15%	99%	-	94%	-
Venezuela	86%	109%	99%	-		-
Chile	94%	152%	99%	-	96%	-
Suriname	88%	125%	99%	-	92%	11,245
Belize	71%	97%	88%	-	98%	-
Uruguay	99%	146%	99%	-	100%	-
Costa Rica	77%	96%	99%	-	97%	-

Appendix 3 – Mobile Enabled Community Services Channels explained

1. Mobile Infrastructure – Leveraging the presence of telecom towers in off grid environments to support rural electrification efforts

More than 4 out of 5 persons living in emerging markets are today covered by GSM networks. In terms of unique subscribers, this represents 2.3 billion people having a mobile phone subscription²⁶ with estimated growth up to 3 billion in 2017. The figure below illustrates that the global growth of mobile networks (i.e. GSM coverage) and unique mobile subscriptions have outpaced the expansion of the electricity grid, clean water and sanitation systems. GSM coverage has however not exceeded the access to clean water and is unlikely to exceed it on a global level, but could support the growth of energy access and water access in urban and rural areas.

Figure 17 – Evolution of the mobile coverage and subscriber's penetration versus access to energy, water and sanitation (2000-2015)



Source GSMA, IEA, UN data (with forecast up to 2015)

As the majority of the population without access to electricity today won't be connected to the electricity grid anytime soon, distributed energy (for example, microgrids) is the immediate solution to connect off-grid households²⁷. For example, the Government of India estimates that two-thirds of its un-electrified households need distributed power²⁸. As mentioned in one of our previous *Community Power from Mobile* reports²⁹, there is an immediate synergy to be found between distributed power providers, i.e. energy service companies (ESCos), and the mobile operators and tower operators in off-grid environments.

Telecom towers can serve as anchor customers to the microgrid operators, bringing steady revenues to the ESCos operating in poorer environments and where sustainability can be challenged by customers' low ability to pay. For the mobile and tower operators, partnering with an ESCo gives them the opportunity to outsource their energy generation to a third-party vendor, securing energy operational expenditures (OPEX) savings while ensuring their requirements on uptime are met.

The GSMA Green Power for Mobile estimated that, at the end of 2011, more than 346,000 BTS³⁰ were operating in off-grid environments, being powered mainly by diesel generators. By 2015, the GSMA estimated that more than 469,000 BTS will operate without a grid connection.

Even in places where the electricity grid is available but highly unreliable, distributed energy can provide a more stable power supply. According to the UN, 1 billion people have

²⁶As people generally have several SIM Cards, GSMA estimates each mobile subscriber had 1.85 SIM card in 2012.

²⁷<http://sierraclub.typepad.com/compass/2012/01/sustainable-energy-for-all-in-2012.html>

²⁸Ibid

²⁹<http://www.gsma.com/mobilefordevelopment/service-over-technology-defining-the-role-for-mobile-in-energy-access-cpm-white-paper>

³⁰The BTS or Base Transceiver Station represents the fundamental GSM communication element enabling mobile phone coverage – the BTS is usually mounted at the top of mobile towers to increase coverage.

access to the electricity grid in an unreliable way. The power outage that affected around 600 million people in India in 2012 has shown the extent of the problem, which is common to many emerging markets relying on old and inefficient power networks. In Africa, manufacturing enterprises experience power outages on average 56 days per year³¹ (a major hurdle to SMEs growth). The mobile towers connected to the grid, but for which power outages are frequent, could also benefit from alternative distributed clean energy to reduce reliance on diesel fuel and/or reduce operating expenses.

2. Mobile Operators Distribution & Mobile Money Agent Networks – Leveraging the footprint and brand of mobile operators to reach underserved customers

The mobile operator's formal product and airtime distribution channels and mobile money agent networks are becoming a national distribution network providing last mile access to mobile communication solutions. For example in East Africa:

- In Kenya, there were more than 96,000 mobile money agents³² across the country in April 2013, providing mobile money services from different operators;
- In Tanzania, there were more than 17,000 mobile money agents in mid-2012³³ and Vodacom indicates 98,000 points of presence³⁴ in the country.

These kiosks and shops carry a trusted brand, reach remote communities and can scale-up responsively to the needs of the community. Leveraging this extensive rural sales dealer/ retail network for the supply or sale of energy devices or water solutions (for example filters and low cost water quality test kits) can allow energy and water entrepreneurs to reach off-grid communities which would be difficult to service otherwise. Added to distribution partnerships with mobile operators, commercial and branding partnerships including marketing activities can increase community awareness on these co-branded products.

3. GSM Machine to Machine Connectivity – Enabling the remote monitoring and Pay As You Go capacity of decentralized utility systems

Machine to machine (M2M) connectivity is becoming an important feature of modern mobile telecom services – the M2M market has considerably matured over the years through the development of innovative business models in several vertical industries (automotive, utility and consumer products) as well as a decrease in the hardware and network costs. Prices of GSM M2M modules are currently ranging from US\$8 to US\$13 and 3G M2M modules from US\$38 to US\$45 for low volume orders (such as 10,000 units). For low cost solutions (such as solar lanterns) retailing from US\$20 to US\$50, the prices of cellular components remain too high to add GSM connectivity to such low value low upgradability products. For larger equipment such as home solar systems (>US\$100) or communal water pumps, the long-range cellular connectivity, which represents a smaller fraction of the total price, adds substantial value to these products and create new opportunities from a business model perspective.

The use of smart GSM meters in household or community utility units could become central to the access and sustainability of energy and water services for the following reasons:

- Financing/credit sales under the PAYG model;
- Monitoring system performance and proactively servicing units that show signs of impending failure;
- Monitoring customer behaviour and leveraging this knowledge to encourage maximum usage and further improve customer service.

Mobile operators have a role to play in providing the SIM connectivity to these “connected solutions”, but there is also a strong opportunity for them to move up the value chain to provide end –to-end services. Still at an early stage now, extensive growth in this area of technology and the development of innovative business models could lead the mobile sector to an inflection point where connected machines will become as preponderant as mobile users.

³¹ <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/0,,contentMDK:21935594~pagePK:146736~piPK:146830~theSitePK:258644,00.html>

³² <http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2013/07/MMU-Infographic-The-Kenyan-journey-to-digital-financial-inclusion.pdf>

³³ <http://www.cgap.org/blog/mobile-money-agents-tanzania-how-busy-how-exclusive>

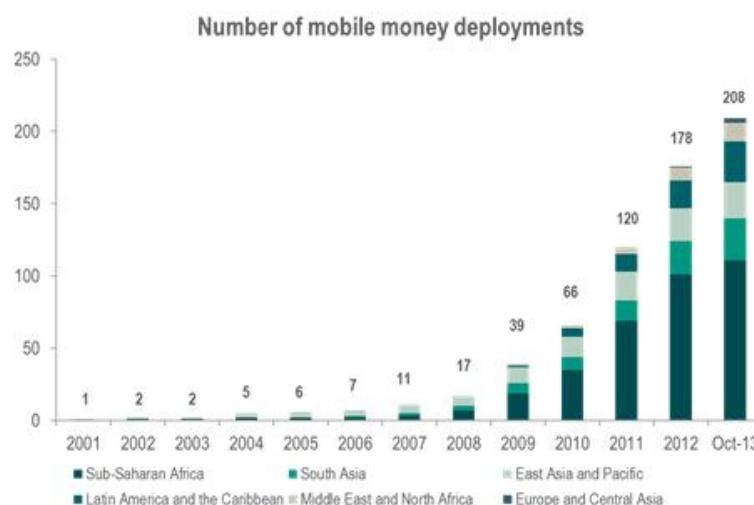
³⁴ The formal points of presence include Vodacom owned and franchise shops, service providers and private outlets, retailers that purchase directly from Vodacom and M-Pesa agents that are unique to M-Pesa sales only.

4. Mobile Payments and Mobile Money Savings – Providing financing and affordable solutions to low income populations

Mobile money has grown from a money transfer platform to a payment platform³⁵; mobile users have now the opportunity to buy products, pay their bills and save money through their mobile phone. As of the end of 2012, there were more than 30 million active mobile money subscribers worldwide³⁶ with more than 150 live deployments in 72 countries. The GSMA identified six mobile money deployments with more than 1 million active customers.

In the new Global Mobile Money Adoption Survey 2013, there are now 208 services live in 83 countries, with 53% of all live mobile money deployments in Sub Saharan Africa³⁷.

Figure 18 – Number of live mobile money services for the unbanked by region (2001-2013)



Source GSMA MMU

Utility bill payments have become an increasingly appealing feature of operators' mobile money services portfolio and recent research on the use of mobile payments on water access in Tanzania clearly shows enhanced payment efficiency for the utility and payment flexibility³⁸ for the end users.

The ability to leverage mobile phones for energy and water payments has recently enabled the development of PAYG solutions tailored to low-income customers. Mobile payments coupled to the use of GSM M2M connectivity (i.e. microcontroller boards embedded in an energy or water system) allow a remote On/Off function, which is essential in a PAYG model. This model offers the opportunity for a previously unbanked and often low-income population to pay but also afford modern energy and water services.

PAYG becomes available for Home Solar Systems with larger capacity

In the case of energy access, the majority of the first generation of PAYG solutions are home solar systems of limited capacity (~4-10W) and include a couple of lights and a phone charging solution, a first step to empowerment for an underserved household. There is today a transition to larger sized systems (>30-40W), allowing the usage of more appliances within an off-grid household but also supporting productive use of power for income-generating activities of Small and Medium Enterprises.

Different models are currently used by energy entrepreneurs providing PAYG solutions:

- Fixed term payments – under a “lease to own” or “solar as a service” model, customers pay a fixed fee per week or per month based on a fixed term contract (1 to 5 years) to

³⁵ <http://www.gsma.com/mobilefordevelopment/mmu-releases-infographic-on-the-kenyan-experience-with-mobile-money>

³⁶ <http://www.gsma.com/mobilefordevelopment/results-from-the-2012-global-mobile-money-adoption-survey-presentation-slides>

³⁷ <http://www.gsma.com/mobilefordevelopment/gsma-announces-initial-findings-from-mmu-2013-global-mobile-money-adoption-survey>

³⁸ Oxford University Research on Mobile Water payments in Tanzania – http://www.ox.ac.uk/media/news_releases_for_journalists/130412.html

- their service provider to use their home solar system. After this term, they can fully own the unit and can use it for free or have the opportunity to transition to the next generation models (for example with larger capacity and increased efficiency);
- Flexible payments – in this model, customers have the freedom to pay what they can afford according to their income and savings. Mobile money services and airtime billing offer a flexible way for customers to repay the full price of the system they bought in a few weeks if they have access to enough cash.

5. Mobile Services (Voice, SMS, USSD, Applications) – Leveraging increased mobile phone ownership to collect/disseminate critical information

Mobile handsets have become increasingly available in the developing world through formal and informal distribution channels, and more affordable thanks to the development of low cost handset models from official makers – but also via the grey markets. For example in Kenya, the monthly total cost of ownership³⁹ of a low cost mobile handset decreased from EUR10.11 in 2009 to EUR2.83 in 2011⁴⁰.

This pervasiveness of mobile phones in rural and underserved locations can be leveraged in different ways to enhance sustainable access to utility services and products:

- Agents of a utility company, government or NGO can use a native application on a smartphone, or a Java application on a feature phone, to collect information about energy or water systems – this information can be then sent directly to the right stakeholders if maintenance is needed and can also be uploaded on online web platforms for increased transparency;
- Individuals living in the community, who might not own a smartphone, can send or receive information about energy or water services (for example, when water will be available for piped connections or what is the quality of a local water source) using voice, SMS or USSD menus.
- Enterprises and agents/village entrepreneurs distributing energy or water related products to underserved communities can optimize their operations in real time and improve supply chain management through mobile platforms (for example, village entrepreneurs can pre-order stocks through SMS if the demand for a product is high).

The development of such solutions on high-end and low-end phones is creating two-way communication platforms, valuable both for the utilities and their customers, enhancing consumer feedback systems and better channelling information to local communities.

³⁹ Total Cost of Ownership of a mobile handset refers to the amount a mobile user has to spend per month to own and use a mobile handset. This include the price of the mobile handset and an average use of mobile services (voice, SMS, data)

⁴⁰ Source Nokia from GSMA MDI website: <https://mobiledevelopmentintelligence.com/statistics/70-monthly-total-cost-of-ownership-usd#>

About the GSMA

The GSMA represents the interests of mobile operators worldwide. Spanning more than 220 countries, the GSMA unites nearly 800 of the world's mobile operators with more than 230 companies in the broader mobile ecosystem, including handset makers, software companies, equipment providers and Internet companies, as well as organisations in industry sectors such as financial services, healthcare, media, transport and utilities. The GSMA also produces industry-leading events such as the Mobile World Congress and Mobile Asia Expo.

About Mobile for Development

Serving the underserved through mobile

GSMA Mobile for Development brings together our mobile operator members, the wider mobile industry and the development community to drive commercial mobile services for underserved people in emerging markets. We identify opportunities for social, economic impact and stimulate the development of scalable, life-enhancing mobile services.

For more information on the GSMA's Mobile Enabled Community Services programme, please email: mecs@gsma.com



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