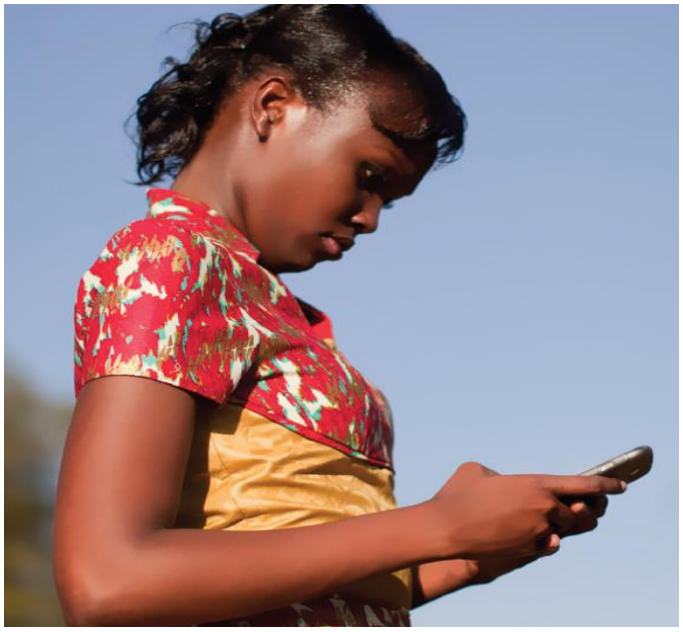
Field Note:
ICT Services to improve performances
of rural water private operators in West Africa

Example of mWater Platform



By Mouhamed Fadel Ndaw, Sr. Water and Sanitation Specialist

November 2015

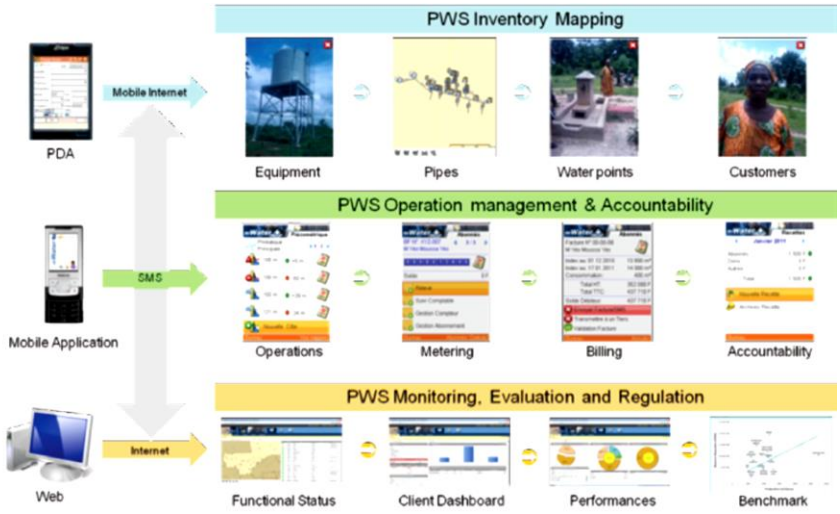
1. INTRODUCTION

This Field Note provides an overview of the mWater platform, based on information from the WSP study on "*Unlocking the Potential of ICT Services in the Water and Sanitation Sector in Africa*[1]" completed in June 2015. This Field Note seeks to provide information on the mWater pilot projects conducted in four West African countries (Senegal, Mali, Benin and Niger) to demonstrate the feasibility of the use of ICT tools to improve the monitoring and management of rural and small town piped water schemes.

The mWater platform is a service-oriented platform developed as a mobile-to-web monitoring system. The platform was developed by the Senegalese mobile solutions company Manobi through a public-private partnership co-funded by the WSP in 2007. As of today, mWater is monitoring 251 water schemes in real-time and has an inventory of more than 35,000 water points in the four countries of Senegal, Mali, Benin and Niger.

The mWater platform provides an ICT design structure in which mobile phone applications and web services are developed to support the life cycle of water supply systems, from construction (inventory and mapping) to operation (data collection, technical and financial management) and performance benchmarking, as demonstrated in Figure 1.

Figure 1: Services offered by mWater (Source: Manobi)



2. MONITORING AND REGULATION FOR IMPROVED SERVICE DELIVERY

Monitoring and governance play a critical role in the sustainability, advancement and quality of water supply schemes. Lack of sustainable planning based on reliable data, and poor coordination between international donors, NGOs and local and national governments have led to a high failure

[1] Study on 'Unlocking the Potential of Information Communications Technology to improve Water and Sanitation Services' by Mouhamed Fadel Ndaw, Sr. Water and Sanitation Specialist

rate of WASH projects. In Africa, while there is considerable variation amongst countries, estimates are that 24-30 percent of rural water supply systems are non-functional[2].

In Senegal, Mali, Benin and Niger, approximately 53% of the rural population have access to an improved water supply (refer to Figure 2 for country breakdown), while 23% of the rural population, or approximately 8.3 million people, have access to a piped water scheme. The majority of these schemes are operated by water user associations, domestic private operators through delegated management arrangements, or other alternative service providers (management models vary by country). The monitoring and governance of these small-scale rural water schemes, for which reliable and up-to-date data is required, play a vital role in the sustainability and quality of the services.

Figure 2: Rural water access statistics in Senegal, Mali, Benin and Niger (WHO/UNICEF, JMP 2014[3])

	Total Population (in '000)	Rural population (in '000)	Rural access rate (2012)	Rural population served (in '000)	Rural access to piped schemes* (2012)	Rural population served by piped schemes (in '000)
Senegal	13,726	7,824	60%	4,694	54%	4,225
Mali	14,854	9,507	54%	5,134	10%	951
Benin	10,051	5,428	69%	3,745	20%	1,086
Niger	17,157	13,726	42%	5,765	15%	2,059
Total	**55,788**	**36,485**	**53%**	**19,338**	**23%**	**8,321**

*A piped scheme is defined as a water system which provides access via a house connection, yard tap or public tap.

In rural areas of developing countries, the data required to improve planning, monitoring and management of water services is often not available due to the high cost of the data collection process. The development of appropriate monitoring tools to address this challenge is critical for effective sector governance, increased system sustainability, and to improve equitability of services provision to poor and vulnerable population groups.

3. THE FIRST GENERATION OF MWATER - SENEGAL PILOT

The mWater platform was developed by Manobi in Senegal in 2007 as a response to monitoring challenges of the growing number of small-scale water schemes in rural areas and small towns. The public-private partnership (PPP) between PEPAM (the Senegalese Water and Sanitation Program for the MDGs) and Manobi, signed in June 2007, provided an ICT framework in which mobile phone applications and web services were developed to support three fundamental elements of the water supply systems: construction (inventory and geo-referencing of

[2] Elizabeth L. Kleemeier 2010 Updated. Private Operators and Rural Water Supplies, A desk review of Experiences.
[3] WHO/UNICEF, JMP 2014. *Progress on Drinking Water and Sanitation. 2014 Update.* Geneva: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation.

infrastructure), operation (data collection, technical and financial management) and regulation. The partnership was supported by WSP.

The platform supports the design and development of applications for the collection and processing of monitoring and evaluation data by exploiting cell phone technologies and "mobile-to-web" protocols in unified databases. The first generation of the platform focused on the development of two layers of services:

- A geographical information system that references the water and sanitation infrastructure using GPS co-ordinates; and
- A set of tools and services assisting water service operators (water associations and private operators) to manage, both technically and financially, their small-scale water supply network.

The first mWater pilot was conducted between April and September 2008 in Senegal, in the regions of Louga and Thies. As part of the first layer of service, the mWater inventory mapping, 58 electronic data forms where collected and transmitted to the system through a PDA (Personal Digital Assistant) application. 56 forms were from water points and 2 from sanitation points[4].

As part of the second layer of service, the first mWater management service, water operators used their mobile phones to send data by SMS on three technical and financial parameters (water production index, financial savings, and breakdowns) which enabled the generation of easy to use monthly performance monitoring reports. Figure 3 describes the frequency of reporting and the utilization of the parameters. By the end of the pilot, the project had demonstrated that by having access to such information, municipalities and other government stakeholders were able to provide better technical assistance, as well as incentives to service providers to improve operational efficiencies.

[4] WSP, 2013. *Assessment of the mWater platform for the monitoring of rural and small towns piped water schemes in Senegal, Mali, Benin and Niger.*

Figure 3 : mWater base parameters

Parameter	Frequency	Utilization
Water meter index	Weekly	Monitors bulk water production.
Cash balance	Weekly	Monitors available cash in current cash books and in bank accounts
Alert SMS on water network breakdown	Ad-hoc	Monitors the number of network breakdowns and servicing disruption days.

4. THE SECOND GENERATION OF MWATER PLATFORM (MWATER+) IN MALI, BENIN, SENEGAL AND NIGER

The positive results obtained by testing the inventory and basic management services in Senegal stimulated the development of a second generation of services targeted to support the management of water schemes in Mali within the framework of the country's technical and monitoring system for small water systems called STEFI (Suivi technique et financier). These services were developed with the financial support of UNICEF and Agence Française de Developpement. The tool, branded as mWater+, monitored 24 water schemes between April 2010 and November 2011 as part of a pilot phase[5]. After the pilot phase was concluded Manobi maintained the platform operational and water operators have continued to use the services offered.

In this second generation of services, the number of parameters collected increased. The new mWater covered three layers of services: inventory and cartography, technical & financial monitoring of the scheme's management and sector performance & benchmarking. Figure 4 below describes the indicators that mWater captures and monitors over time for each water supply system.

Figure 4: Data indicators monitored by mWater+ Platform

Access indicators	Number of water points
	Population coverage
Consumption indicators	Meter readings
	Average consumption
User quality of service indicators	Water quality
	Continuity of service
Technical indicators	Functional status of the infrastructure
	Network efficiency or Non-Revenue Water
Economic and financial indicators	Energy costs
	Lifespan of infrastructure and equipment
	Renewal fund

[5] WSP, 2013. *Assessment of the mWater platform for the monitoring of rural and small towns piped water schemes in Senegal, Mali, Benin and Niger.*

	Costs
	Production costs per m3
	Revenue
	Inventory statement
	Available cash flow
Pricing indicators	Tariffs
	Average bill collection period
	Bill collection rate

Monitoring these indicators enables an assessment of how well the water supply system is operating and informs decision-making that will ensure the sustainability of a quality service based on reliable and objective information. By capturing more data in the production, distribution and commercialization phases of the systems, Manobi was able to build a more complex web dashboard in order to track indicators and generate automatic reports (refer to Figures 5-7).

Figure 5: mWater phone application and web platform


mWater
Opérations
Index
Energie
Carburant
Pannes
Piézométrique
Aidez-moi
A propos
Quitter
NOKIA
1 oo
2 abc
def 3

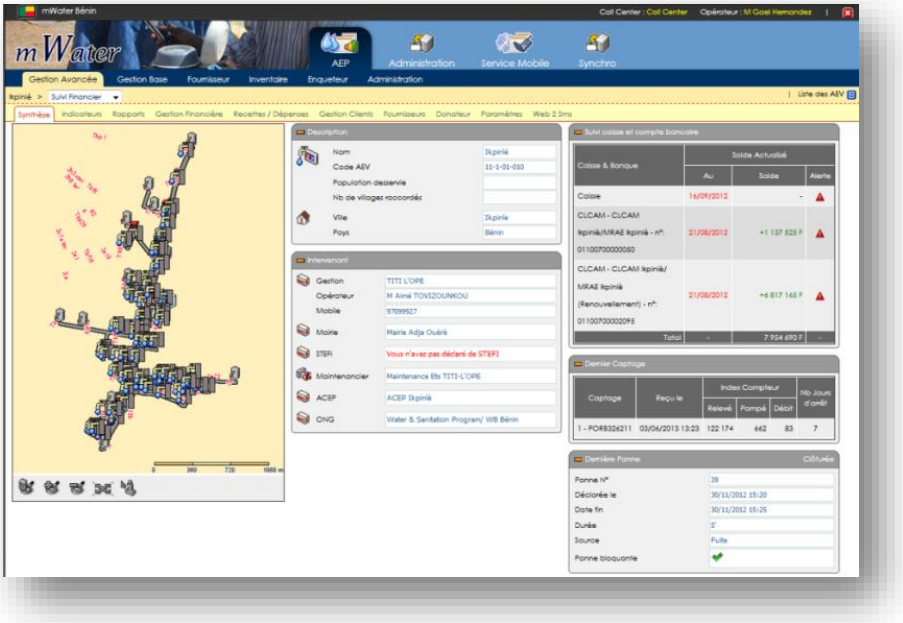
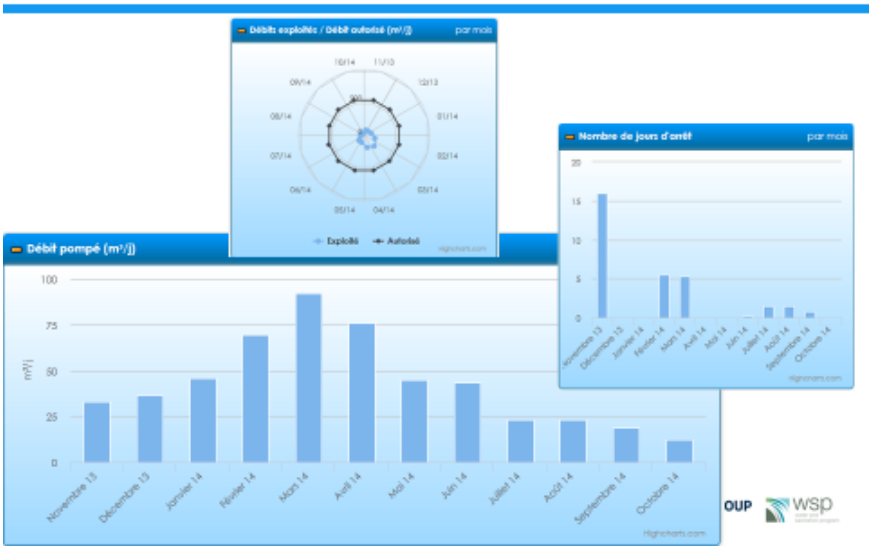

mWater Bénin
mWater
AEP
Administration
Service Mobile
Synchro
Gestion Avancée
Gestion Base
Fournisseur
Inventaire
Enqueteur
Administration
Description
Intervenant
Suivi caisse et compte bancaire
Dernier Captage
Dernière Panne

Figure 6: Visualization of mWater data – water source[6]

Figure 7: Visualization of mWater data – water rates[7]



The application enables[8]:

- Monitoring and management of the operation and maintenance of small piped systems, including breakdowns, service outages, water losses and leaks, and other physical problems;
- Monitoring of the operational status of the infrastructure and equipment, such as the distribution network, water points, pumping equipment, etc.;

[6] Adokpo Migan, S. 2014. *mWater – Passage à l'échelle, contractualisation. Atelier régional*. WSP, Banque Mondiale. Présentation PowerPoint. 17 diapositives.
[7] Adokpo Migan, S. 2014. *mWater – Passage à l'échelle, contractualisation. Atelier régional*.
[8] Cowater & iComms, 2015. *TIC dans le secteur Eau, Assainissement et Hygiène (WASH) – BENIN – L'étude de cas de MWATER*. Unpublished case study prepared for WSP.

- Dynamic mapping of system components, allowing the tracing and visualization of the network;
- Collection of data on availability and consumption of water, such as water volumes, water available at the water points and in reservoirs, as well as fees collected;
- Collection of information on the evolution of supply and demand for drinking water and the related business services, including information on users, details of selected services, volumes consumed and accounting; and
- Collection and analysis of the financial operation and sustainability of the services provided, allowing the evaluation of the state of the infrastructure and services offered, the value of capital investments, financial performance, etc.

Interoperability and greater data accessibility through open data standards are possible with mWater. The data can be exported from mWater in Excel or GIS format for analysis by any application. However, this access to data needs to be carefully controlled and regulated by establishing clear rules and documenting roles and responsibilities.

The mWater+ service was further deployed in Benin from December 2011. Fifty one (51) water schemes, serving 169,000 people across 13 *communes*[9], received technical assistance through WSP support to the Beninese government. Later, in February 2012, the government of Niger also requested the support of WSP to use the mWater platform for assistance and support of 62 water schemes in the Tahoua region[10]. The pilot, conducted between November 2012 and October 2013, was so successful that the government wants to scale up to the entire country.

In January 2013 Manobi began to offer the mWater+ service to 14 water operators in Senegal. This operation was financed by the Luxembourg Government through the PEPAM LuxDev project[11]. WSP is currently supporting OFOR (Office des Forages Ruraux) in the Central zone to implement a second scale up, to 600 systems[12].

More recently, in September 2014 the third generation of mWater, with advanced functionality, was scaled up and used to inventory 151 schemes in Benin[13]. 62% of the piped water schemes in Benin under delegated management are now monitored using mWater[14].

[9] Manobi, 2013. *Rapport Final de la Mise en Route de la plate-forme mWater d'appui au suivi-gestion des AEP et formation des beneficiaires*. Prepared for WSP.

[10] WSP, 2013. *Assessment of the mWater platform for the monitoring of rural and small towns piped water schemes in Senegal, Mali, Benin and Niger.* Data also corresponds to Manobi website & Cowater & iComms, 2015. *TIC dans le secteur Eau, Assainissement et Hygiène (WASH) – BENIN – L'étude de cas de MWATER*. Unpublished case study prepared for WSP.

[11] WSP, 2013. *Assessment of the mWater platform for the monitoring of rural and small towns piped water schemes in Senegal, Mali, Benin and Niger.*

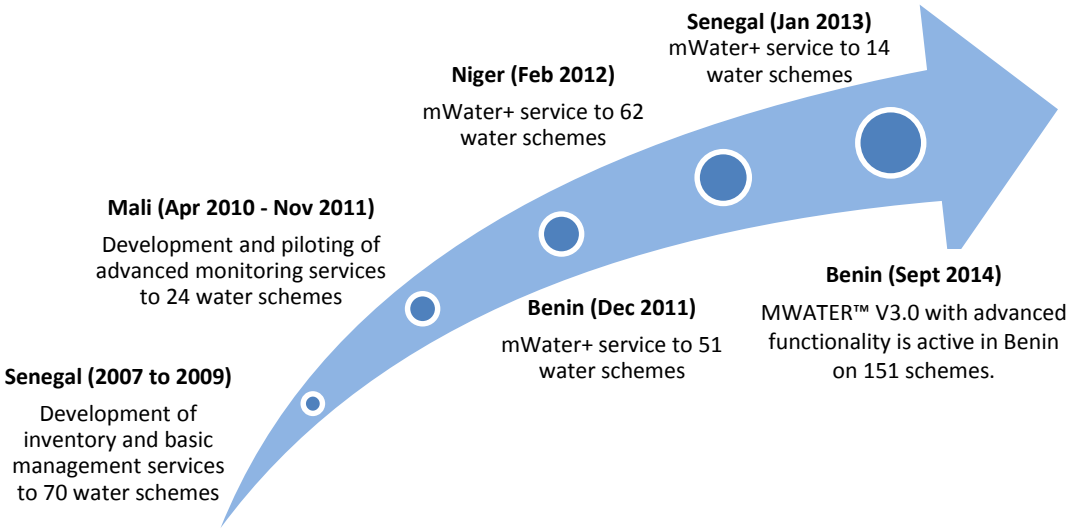
[12] Cowater & iComms, 2015. *TIC dans le secteur Eau, Assainissement et Hygiène – le cas du Sénégal.* Unpublished case study prepared for WSP.

[13] Adokpo Migan, S. 2014. *mWater – Passage à l'échelle, contractualisation.*

[14] WSP. 2014. *Using Mobile to Web Technology (mWater) to Improve Efficiency of Water Supplies (Benin case).* Presented at 2014 World Water Week, Stockholm.

Figure 8 demonstrates the timeline of the development, piloting and scale-up of the mWater platform.

Figure 8: Timeline of development of mWater services



The inventory service of mWater has been implemented in Senegal, Mali, Niger and Benin with the results shown in Figure 9.

Figure 9 : mWater inventory pilot results

Country	Water points inventoried
Senegal	29,062[15]
Mali	1,760[16]
Niger	1,288[17]
Benin	3,663[18]
Total	**35,773**

In Senegal, as of June 2013, nearly 30,000 water points were referenced (85% of the existing water points). Key advantages of the electronic inventory were a faster referencing of each water

[15] Total figure aggregating inventory (26,262), mWater basic (1758) and mWater+ (678). Data from: WSP, 2013. *Assessment of the mWater platform for the monitoring of rural and small towns piped water schemes in Senegal, Mali, Benin and Niger.*

[16] WSP, 2013. *Assessment of the mWater platform for the monitoring of rural and small towns piped water schemes in Senegal, Mali, Benin and Niger.*

[17] Cowater & iComms, 2015. *TIC dans le secteur Eau, Assainissement et Hygiène – le cas du Niger.* Unpublished case study prepared for WSP.

[18] Cowater & iComms, 2015. *TIC dans le secteur Eau, Assainissement et Hygiène (WASH) – BENIN – L'étude de cas de MWATER*. Unpublished case study prepared for WSP.

point (3 to 5 minutes per point), automatic transfer and immediate integration to the web platform and 30% reduction of data collection costs. In Benin, the use of mWater for inventory purposes resulted in the reconstitution of drawings of assets and water networks for 51 rural water schemes.

The mWater+ platform is actively monitoring 251 water systems in the four countries, which represents 7% of the 3,579 estimated total number of schemes in Senegal, Mali, Niger and Benin, as shown in Figure 10. This does not include the 600 schemes in Senegal where scale-up is currently on-going.

Figure 10: Deployment of mWater in Senegal, Mali, Benin and Niger[19]

Country	Water schemes monitored	Total water supply schemes	%
Senegal	14[20]	1,505	0.9%
Mali	24[21]	600	4%
Niger	62	1,017	6%
Benin	151[22]	457	33%
Total	**251**	**3,579**	**7%**

In the case of Benin, mWater has enabled municipalities to have access to essential data on the water infrastructure in their jurisdiction, and according to Manobi[23], mWater has facilitated access to financing for service providers through documentation of historic data on technical and financial operations permitting investments in the system, for example, investments required for expansion. Previous to mWater, these data were simply not available.

5. FINANCING

All the core mWater mobile 2 web platform infrastructure and software has been entirely financed by Manobi. Development partners have contributed to implementing the mWater platform within the specific countries through the financing of pilots to test it and through participation in the scaling up process, as in Benin.

In Benin, business-to-business contracts are being put in place to maximize financial sustainability as part of the scale-up and the WSP/World Bank exit strategy, in collaboration with the *Direction du Service Public de l'Eau de la Régulation*.

[19] Data from : WSP, 2013. *Assessment of the mWater platform for the monitoring of rural and small towns piped water schemes in Senegal, Mali, Benin and Niger.* All data cross-referenced with additional sources, including Cowater's country case studies prepared for WSP (2015) and Manobi's website.

[20] Another 70 water schemes were monitored using the mWater basic version but are no longer active as of June 2013, according to WSP, 2013.

[21] The total water schemes to be monitored in Mali were 55 but due to security reasons, the number had to be reduced to 24, according to WSP, 2013.

[22] Updated data from : WSP, 2014. *Using Mobile to Web Technology (mWater) to Improve Efficiency of Water Supplies (Benin case).* Presented at 2014 World Water Week, Stockholm.

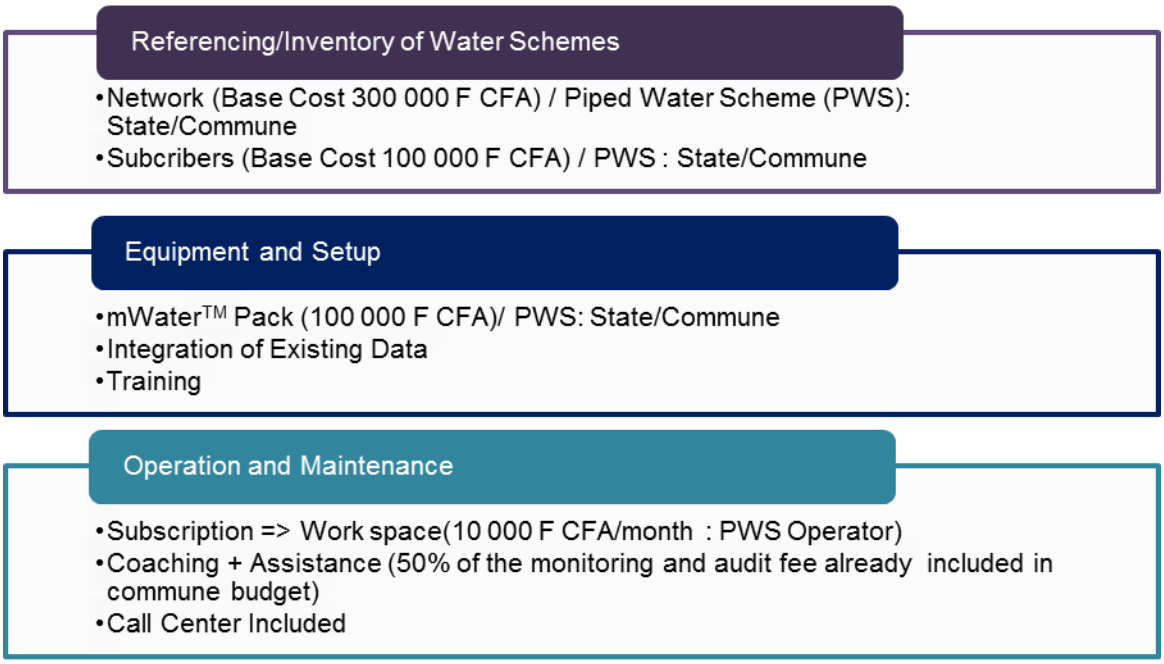
[23] Manobi, 2013. *Rapport Final de la Mise en Route de la plate-forme mWater d'appui au suivi-gestion des AEP et formation des beneficiaires*. Prepared for WSP.

According to Manobi, three types of costs are included in the scale-up of mWater[24]:

- Referencing/inventory of water schemes, a capital investment required prior to the deployment of mWater;
- Equipment and setup costs for water service providers, including a configured mobile phone with the mWater application, initial data entry, and training of service provider personnel; and
- Operation and maintenance costs for the mWater platform, including on-going support and reporting.

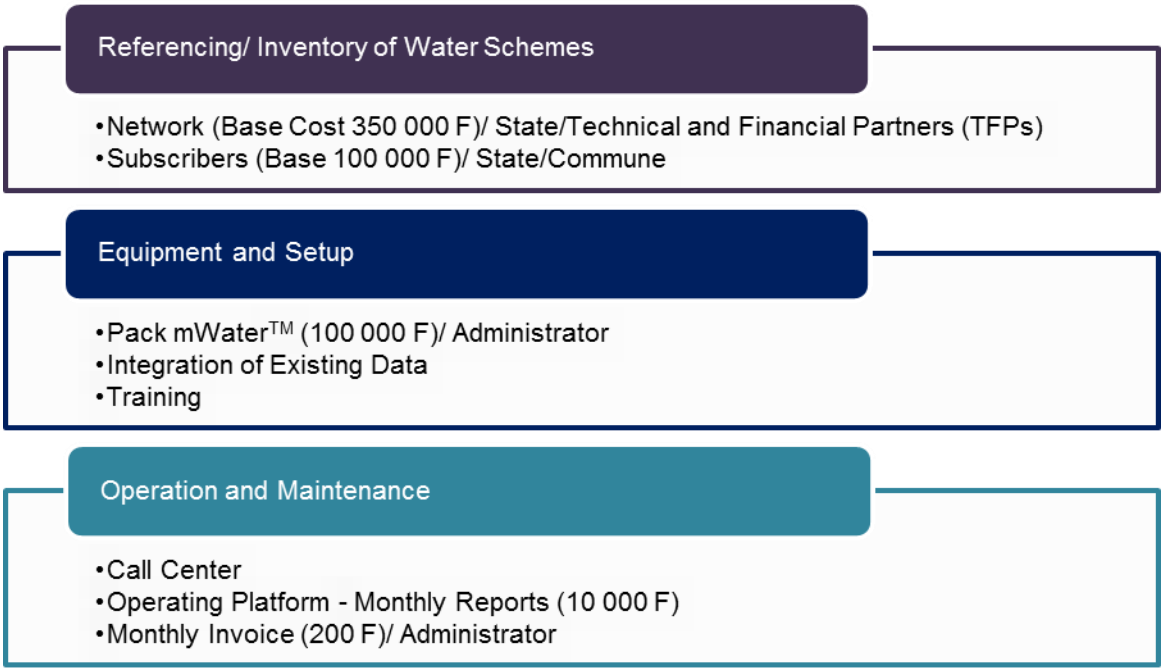
These costs vary per country and are demonstrated in the cases of Benin and Niger in Figures 11 and 12. Costs in Mali were higher with total costs estimated at CFA 2,673,000 per scheme[25].

Figure 11 : Cost per system of mWater in Benin[26]



[24] Manobi, 2013. *Rapport Final de la Mise en Route de la plate-forme mWater d'appui au suivi-gestion des AEP et formation des beneficiaires*. Prepared for WSP.
[25] WSP, 2013. *Assessment of the mWater platform for the monitoring of rural and small towns piped water schemes in Senegal, Mali, Benin and Niger.*
[26] Adokpo Migan, S. 2014. *mWater – Passage à l'échelle, contractualisation.*

Figure 12 : Cost per system of mWater in Niger[27]



Included in the above are the costs of building the capacity of local and central government to use the platform, assess the data and integrate the data into management decision-making, the cost to the service provider for on-going data collection and air time and the cost to government to maintain oversight over the monitoring process. There is no additional cost for equipment as mWater runs on existing computers and smartphones.

6. KEY CHALLENGES

The following key challenges in scale up of the platform were identified during implementation in the four pilot countries:

Diversity of the water sector in each country

The diversity of the water sector in each country is a challenge that requires a great level of contextualization and adjustment to the reality of rural water management. For example, the system had to be adapted based on the existence of a regulatory body, the type of delegation mode (public/community based vs. private management of water schemes), the multiplicity of schemes managed by the same operator, the existence of technical support services, the diversity of the water price structure by country, etc. In each country, the platform had to be customized according to these aspects.

[27] Manobi, 2013. *Rapport Final de la Mise en Route de la plate-forme mWater d'appui au suivi-gestion des AEP et formation des beneficiaires*. Prepared for WSP.

Connecting with mobile operators

Establishing partnerships with mobile operators in new countries can present technical and financial challenges when scaling-up services. By aligning with an operator who works in multiple countries the negotiation across boundaries can be simplified.

Lack of mobile and internet infrastructure

The coverage and reliability of ICT infrastructure, particularly mobile infrastructure, is increasing rapidly in African countries, including in rural areas. However, there are still remote areas which do not have access to these services or to electricity, limiting the applicability of the mWater platform in these areas (e.g. in Niger mobile phone penetration is approximately only 40% of the population). The cost of internet access can also be prohibitive.

Resistance to change

The mWater platform enables greater transparency and accountability in the water sector, which for the public is a direct benefit. However, operators and local government may be less willing to embrace a system which facilitates public accountability and financial transparency.

Stakeholder relationships

Management of stakeholder relations between the public and private sector, including potential implementing partners, requires close coordination between the various stakeholders, who do not always have the same objectives. Particularly in the context of PPP, reaching consensus can take significant effort and time.

7. SUCCESS FACTORS FOR SCALING UP

The key factors for successful scale up, drawn from the four pilot countries, have been[28]:

1. Demand driven process: The client should act as project champion, driving the scale up process according to its needs, with the participation of water service providers.
2. Standardization: Standardized terminology will ensure consistent asset description and categorization, and clearly defined performance monitoring indicators, while standard reporting formats facilitate assessment and benchmarking.
3. Piloting: A successful pilot demonstrates results to stakeholders and enables identification and mitigation of potential bottlenecks. Results in terms of improved scheme performance and profitability can be used to gain stakeholder confidence in the advantages of the application.

[28] Success factors collected from the following sources :
WSP. 2014. *Using Mobile to Web Technology (mWater) to Improve Efficiency of Water Supplies (Benin case).* Presented at 2014 World Water Week, Stockholm.
Cowater & iComms, 2015. *TIC dans le secteur Eau, Assainissement et Hygiène – le cas du Niger.* Unpublished case study prepared for WSP.
Cowater & iComms, 2015. *TIC dans le secteur Eau, Assainissement et Hygiène (WASH) – BENIN – L'étude de cas de MWATER*. Unpublished case study prepared for WSP.
Cowater & iComms, 2015. *TIC dans le secteur Eau, Assainissement et Hygiène – le cas du Sénégal.* Unpublished case study prepared for WSP.

4. Sequencing of implementation: The mWater platform should be implemented through a step-by-step process, beginning with inventory/mapping, adding core service monitoring tools and finally added value services. This allows the sector to gain an understanding of the tool, facilitates its acceptance and use, and enables capacity to be developed in a sustainable manner.
5. Cost-sharing business model: A public/private cost-sharing business model will contribute to the financial sustainability of the platform.
6. Clear roles and responsibilities: The roles and responsibilities, as well as data access regulations (conditions for access, data ownership), must be clearly delineated, including in IT services contracts and agreements between stakeholders, to ensure the most appropriate levels of access to the data and its effective analysis and use.
7. Monitoring and supervision: Continuous monitoring of the scale-up phase is essential to ensure appropriate systems and processes are put in place and results achieved. Close monitoring by higher levels of government using the data produced enables corrective actions to be taken with each service provider as required, and also institutionalizes use of the data for monitoring purposes.
8. Addressing the quality of wireless connectivity: A methodology for rapid incident management should be agreed upon with the mobile service provider to ensure service issues were dealt with within 24 hours.
9. Responsive reporting formats: A responsive platform that can be customized to meet the reporting needs of a particular country, and generate required reports enables standardization of reporting and also creates an incentive for uptake of the platform by service providers and government.
10. Standardized data collection: A standard process for data collection, including when and the number of times data is to be collected each month, enables the reports generated to be comparable between service providers and municipalities.
11. Ownership of results: Key stakeholders, including the sector regulator, must be highly involved in the planning and implementation process. Data collection, and more importantly its use in planning and management decision-making, need to be institutionalized at all levels and integrated into sector regulation to ensure sustained demand for the data.
12. Capacity building: Customized capacity building should be delivered for each group of users (administrator, approver, operator, user), including on-going capacity building for all stakeholders and users of the tool.

8. CONCLUSIONS

1. The four successive mWater pilots in Senegal, Mali, Benin and Niger have demonstrated that it is possible to collect data from remote rural areas using mobile phones and to provide a web platform with almost real-time data that can be analysed and used to improve the management of the schemes.
2. The inventory service provided by mWater has demonstrated that it is possible and necessary to document with accuracy water assets and to plan renewals and extensions to ensure effective management of those assets by:
   a. Normalising the description and data collection system of water assets.

   b. Organising all stakeholders in the usage of a collective data warehouse by ensuring collection and update of the same asset datasets.
   c. Reducing the costs and delays of conducting inventory and cartography of water assets.
3. The technical and financial management services has shown that it is possible to collect operational data and provide valuable feedback information to service providers to improve the ability to analyse sector data and as a result the management of the schemes, and produce automated reports:
   a. The customer management module strengthens consumer confidence in the quality of service of the water operator through more transparent service delivery.
   b. The equipment and network breakdown alert module can improve the organization of maintenance services.
   c. The automatic report generation module concerning production, distribution and management of the schemes increases interaction between the water operators, municipalities and the sector government authority and enables better monitoring by local government.
   d. The applied transparency in financial flows and technical management of the water systems allows for better accounting reports and increases the possibility for service providers to self-finance network extensions and household connections by using commercial banks and local financial institutions, as the data permit a better evaluation of the potential and economic possibilities for investors and operators.
4. The benchmarking and regulation services will strengthen the capacity of the State to effectively use the results to plan and monitor investments, enhancing the level of water access and the quality of water for the most vulnerable populations. It also enables comparison in close to real-time of water operators' performance and facilitates regulators' decisions on contract management and support to service providers.
5. The regional approach adopted with the mWater platform facilitates:
   a. Sharing of investment and operational costs of the tool, making the service more accessible to the greatest number of water operators, municipalities and government services.
   b. Normalising national and regional monitoring indicators for the performance of water systems, enabling comparison at different scales.
   c. Stimulating the development of the quality of service by sharing experiences with a common technical base between neighbouring countries in the framework of a straightforward and simplified South-South cooperation.
6. The pilots demonstrated that an ICT-based platform such as mWater allows information-sharing amongst all stakeholders in the sector and enables the harmonization of monitoring and reporting tools which then can facilitate comparisons at the local, regional and national level. This can result in improved sector planning and resource distribution based on results achieved at the local level (through benchmarking) and focusing resources on underserved areas and populations enabling more equitable services distribution.
7. The improved information availability and management of the schemes as a result of mWater permits an increase in profitability and encourages the implementation of PPP concessions with private operators.

8. Benchmarking of the on-going performance of private operators can support increased transparency, elevate business standards and highlight areas where capacity strengthening is needed.
9. Finally, it was demonstrated that financial and human resources support, as well as an exit strategy from external support and the development of an appropriate business plan are required to ensure the sustainability of the platform and its on-going use.