Water Point Mapping and Monitoring Series

Failure and the Future

Tuesday 18 November 2014
RWSN Mapping and Monitoring

The Rural Water Supply Network has conducted a webinar series aimed at sharing knowledge and evidence from government-led mapping and monitoring of rural water supply services. In a series of four webinars the discussants, facilitators and participants explored the history of Water Point Mapping (WPM), present examples of district and national monitoring systems through a series of case studies, looked back at cases of failure and forward to the latest developments and innovations designed to enable improved mapping and monitoring of water supply services. Technical aspects as well as elements of related policy and practice were shared.

WPM is acknowledged as a useful tool for investment planning and decision making by national governments, development agencies, NGOs and other actors, particularly in under-serviced rural areas. Though in theory WPM should contribute to greater accountability, transparency and equity in service delivery, and in some cases it does, there are still many challenges in keeping data updated and ensuring it is used properly.

The fourth and final webinar in the RWSN Water Point Mapping series provided a candid account of the challenges with WPM that have led to failed objectives. There are, however, valuable lessons to be learned from those failures, and the experiences have provided useful models and contributed to improved knowledge and data banks. The webinar also discussed the future of WPM, including new models and initiatives to maximize the benefit of data monitoring and improve information accessibility and transparency.

Chair
Ton Schouten, Senior Programme Officer, International Water and Sanitation Centre (IRC)

Contents

What is WPM?

Water point mapping is a tool for monitoring water point distribution and functionality used by governments and NGOs to improve service delivery. The process includes data collection and entry, which is often then translated into a visual tool for analysis, generally in the form of a map displaying geographic distribution of water points, their functionality and usage statistics.

Failure:

WPM Experience in Mozambique

Speaker: **Erik Harvey**, Arjen Naafs
WaterAid

"Begin with the end in mind."

Gossa Wolde, 2014

Program background

As an opportunity to learn from failure, Erik Harvey from WaterAid shared the organisation's experience of WPM in Mozambique. WaterAid worked in conjunction with the government of Mozambique and began developing the process with a GPS based system that required manual data entry into a spreadsheet. The process was built so it could be operated by local staff, local training programs were established, and unreliable pre-existing government data was reviewed and updated (or replaced). The program originally involved the use of ArcGIS software and led to the design of a database module that served as an add-on to the government database.

Not including staff costs, technical support and logistics costs, to perform the above costs amounted to $20,000-30,000 per district. The data collection process took about one month for each district, and significantly longer to process the data. WaterAid funded the data collection in districts in which it was working at the time and advocated other actors present in the region, such as UNICEF, to fund the rest.

Data findings

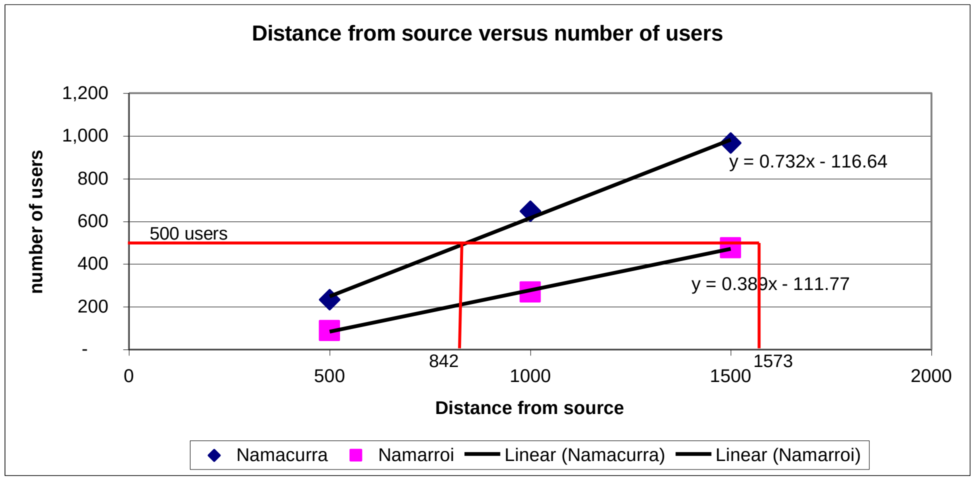
An important part of WA's data monitoring in Mozambique included simulations of future population numbers, evaluations of coverage at district level and comparisons with the MDGs targets. This process allowed WA to evaluate and demonstrate the costs and requirements to the government on how to measure coverage, functionality and also to assess the future invesment requirment to meet the MDGs (see table below).

Simulation of Sanga Requirements to Meet MDG Targets

Coverage Alternatives	2015 Population of Sanga (INE Calculations)	Definition of Coverage	Operational Water Points in 2003	Coverage at present ***(coverage needed to meet MDGs)***	# of functioning water points needed in 2015 to meet MDG target	# of water points required to meet MDG targets in Sanga
Coverage Alternative 1	98, 087	500/water point	84	72.90 % ***(86.45 %)***	169	**85**
Coverage Alternative 2	98, 087	500/water point	69	59.88 % ***(79.94 %)***	156	**87**
Coverage Alternative 3	98, 087	500/water point	69	57.45 % ***(78.72 %)***	154	**67**
Coverage Alternative 4	98, 087	500/water point	65	54.12 % ***(77.06 %)***	151	**86**
Coverage Alternative 5	98, 087	500/water point	43	35.80 % ***(67.90 %)***	133	**90**
Coverage Alternative 6	98, 087	203/water point	43	14.53 % ***(57.26 %)***	276	**233**

WA began formally linking the WPM data with the government database in the first years of 2000 in coordination with the National Ministry of Public Works. The monitoring process was then scaled up and improved and the database was automated using MS Access software (to align with the Ministry database system) and to allow transfer to ArcGIS. One entire province (Zambezia) was mapped and other districts in Niassa. A0 maps displaying physical output of water points in the district were sent to each district water office. The maps were often hung on walls in district offices, and in fact are still present, but whether they are used accurately and updated often is still in question.

The initiative provided a huge opportunity for data analysis and visualisation, including a way to calculate population density, distance to water point data and population per water point. It also demonstrated the use of data collection from schools and health posts.



Namacurra	500 people within	842	meters from a water source
Namarroi	500 people within	1,573	meters from a water source

WaterAid's data findings showed that government policy of a 500m walking distance per WP was not viable, which was important in WPM advocacy.

Improved and un-improved water point data were collected as part of the process. Data was analyzed and compared to the national policy standards, in particular around the 500m distance to water point for 500 users, to provide evidence of the non-viability of the current government policy and to demonstrate the actual coverage data. This work questioned the existing policy and influenced the change of the national water policy, as standards for number of users and access to water point were then changed.

Long term impact on WPM process

"We confused our own research interests with the building of a viable system."

Erik Harvey, 2014

The results were significant and useful, but did not achieve the core objective of building a system that enabled the government to regularly collect, visualize and analyze their own data, particularly at district level. The government's data management processes were not adequately analysed and understood, and the MS Access based system had weaknesses. The technology used by WA required high training overhead and costs to be maintained, and ultimately WA did not separate sufficiently its research interests from the goal of building a viable and sustainable system.

The experience however still provided learning on mapping and data management and on ways of working with district government. It influenced government policy, and the maps generated are still on district office walls. The work contributed to the development of the spreadsheet based **Water Point Mapper** as an alternative tool. The effort further opened the space for collaborating with the government on new mechanisms for data collection and updating and has contributed overall to sector learning and a modified approach that suits country and program realities.

Questions for Erik Harvey and Arjen Naafs

Q: How were the findings demonstrating the gap between the official statistics received by the government?

Firstly, as the work was done directly with district authorities, they accepted the results. A political choice was made not to publish the results widely, but to use them to discuss issues with government and within the sector forums. This resulted in a relatively positive discussion of the issues which needed to be addressed.
An aspect worth consideration is that the mapping included all water points, even older ones that had been dysfunctional for long time, which brought down functionality rates considerably. This highlights the issue of consistency of indicators' definitions (i.e. should water points include the ones that were built 10 years ago and have been dysfunctional for the last 5 years)

Q: What kind of capacity was required to do the analysis on distance of water points? What does that say about future needs for the ability to analyze and interpret information?

In the early 2000s, ArcGIS was used for area coverage calculations. Today there are different tools available, like WaterAid's Water Point Mapper, which includes area calculations and visualisation. At the time, it required high input and was therefore not available at district level. Significant improvements in technology allow now for better and with easier access monitoring processes. The main issue and weakness remains, however, around the use of the data.

Q: How quickly do you think the collected data from your WP survey was getting out of date? Were the authorities able to keep track on updating data?

A key weakness of the project was that an updating mechanism was not designed from the initial phase - a common issue amongst many monitoring initiatives. Some ideas for this were developed however too much attention was given to the data and the technologies itself. This has driven learning for us and for others - monitoring systems need to be designed around a viable updating mechanism and the people that need to provide the data.

Failure:

WPM in Tanzania: A reality check

Twaweza *ni sisi* Speaker: **Ben Taylor**, Twaweza

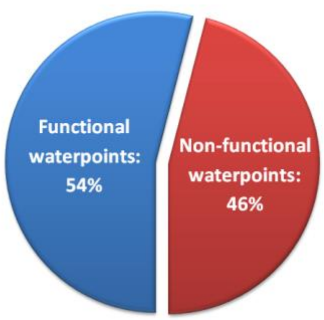
Who **shouts** the *loudest* ?

Program background

Ben Taylor shared the experience of Twaweza in Tanzania, one of the first countries to adopt the practice of WPM after WaterAid introduced in the early 2000s. By 2009, around half of Tanzania's districts were mapped and WPM had become a tool and process recognized and backed by important actors, including the World Bank. The Ministry of Water adopted WPM practices and rolled out mapping activities on a national level between 2010 and 2012. The program introduced surveys that highlighted key issues with service delivery.

Data findings

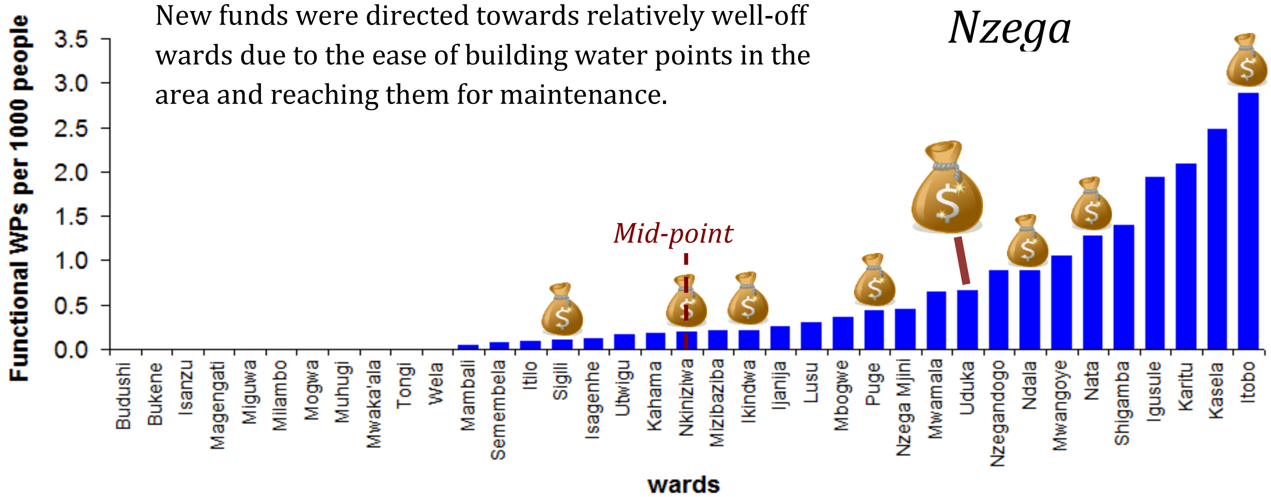
1. Water flow was inconsistent and unsustained



The situation observed was much worse than what the government communicated. Objectives were focused on meeting MDGs related to water access, so attention was greater on new investments: nearly half of funds were spent on new water points instead of addressing functionality issues.

2. The distribution of water points was highly unequal

New funds were directed towards relatively well-off wards due to the ease of building water points in the area and reaching them for maintenance.



Ultimately, residents of under-serviced rural communities were very frustrated, and surveys indicated that water access and functionality were a high priority for them.

WPM as a response to service delivery issues

Several different approaches and monitoring processes were developed to address service delivery issues in Tanzania:

1. WaterAid and others' approach, most frequently used: maps and reports were shared with District Water Engineers, however no evidence of data use or data regularly being updated was present. The issue with this approach was that it was a technical and administrative solution to a political problem.

2. The second approach involved the mobilisation of communities towards influencing local government. This aimed at being a political approach to a political problem and gave citizens the ability to report on local water point problems via SMS, in turn providing local water departments with quick and timely information. The media was employed in amplifying the information provided. This attempted to pressure local water departments to respond to problems, but ultimately the relationship between communities and local governments was too sensitive to allow full mobilisation, and the approach failed as it saw little engagement from the community.

3. The third approach involved a nation-wide water point monitoring roll-out by the Ministry. The process however is slow and there is a reluctance to release data due to potential consequences for poor performance. The cost also saw a sharp increase, rising from $10,000 per district when operated by WaterAid to $30,000 when operated by Tanzania's Ministry of Water. Other issues included the delayed in data publishing and the complexity of the database targeting more technical audience rather than public. Furthermore concerns around data integrity as a result of the non-objective nature of the governments control over the data management are also present.

The lessons to be learned from the experience in Tanzania are that rural water supply faces political challenges – investment and planning processes are highly dependent upon personal connections. Despite this, WPM can still play an important role in political influence, but independent data collection and management might be a worthy option for investment.

Questions for Ben

Q: Are private residence water points with in-yard connections, where water is sold to neighbors, included in Tanzania's national WPM database?
After much discussion, the decision in Tanzania was to include every water point from which water is available to the general public, even if it is privately owned and located. Nevertheless, it is recognized that, when data is collected, decisions will be made that may vary despite agreed protocol. This kind of variation is to be expected with this method of data collection.

Q: Is it arguable that water point mapping now needs to be rolled out by communities? Would it then potentially be cheaper?
Community management of maps and monitoring would be beneficial as the community itself could be responsible for monitoring, but given experiences where this has been implemented, take up doesn't seem to be very high. There are some urban areas were community-led mapping has produced interesting findings, but that doesn't mean it will be feasible for roll-out in rural Tanzania.

Future:

GWC Water Point Data Sharing

Speaker: **Brian Banks**, GWC

> "The goal is to turn data into information, and information into insight."
>
> *-Carly Fiorina, Former CEO of HP*

Project background

The Global Water Challenge (GWC) is a coalition of leading organizations in the WASH sector that are committed to addressing water and sanitation issues. Brian Banks shared the GWCs water point data sharing initiative, the goal of which is to create an efficient framework for sharing water point data (mostly in rural areas) and make it more accessible, allowing collected data to be more available and used. The GWC wants to create a system for sharing data that already exists and to promote the application of the data in analysis and decision making. The scope of the initiative is limited to water point data, (avoiding functionality analysis as initial stage), and aims to consolidate data for rural areas on a global scale.

Goal

- **Create an efficient framework for sharing water point data among diverse users and over time.**
- **Create system for sharing data and promoting application of the data.**

Scope

- **Water point only**
- **Largely rural**
- **Global**

Water point data has been growing in both quantity and quality, so the GWC recognized an opportunity to begin consolidating and standardizing the data. Data has been produced by various sources, including NGOs, national surveys and university-led academic studies, and the goal of the GWC initiative is to bring together this data and make it available for use by all stakeholders. Furthermore, the project aims at facilitating the updating of data overtime (by combination of data entries by different stakeholder).

Methodology

It was emphasized that currently the question being answered by the initiative was not around water point functionality, or the best ways to collect data or the best indicators to use, but more broadly to **bring together data that is already collected**. For the recent pilot of the system, the GWC underwent extensive combing for publicly available data as well as outreach across networks, resulting in over 40 unique stakeholders submitting data. The GWC received 70 datasets which included over 2,500 indicators from different actors, including 15 different countries, 25 NGOs and 5 academic and independent consultants.

From this data, the GWC identified a trend of 14 commonly occurring attributes based on the frequency of indicators corresponding to particular attributes across the datasets. The final draft of standards included the 14 commonly occurring attributes, each of which occurred in over 50% of the collected datasets, plus an additional three to ensure technical functionality. **The 17 standards are the following**:

Latitude	Water Source	Implementer
Longitude	Extraction Technology	Presence of Water when Assessed
Village	Installation Year	Condition
District	Management Structure	Date of data collection
Water Point ID	Payment Structure	Photograph URL
Country	Cost/Unit	

The GWC will additionally aim to capture the source of the data and provide the original database (or link to this).

Full write-up on data exchange standard:
http://sustainablewash.org/sites/sustainablewash.org/files/wash_datapoint_update_september_2014_compiled_with_appendices.pdf

Next steps

The GWC plans to initiate a broad working group that is open for input from any interested party, and he invited anyone to share their input with him directly via email.

Broad schedule:

- Provide public comment **(Q1 2015)**
- Prepare to begin sharing data **(Q2 2015)**
- Share input on structure of online platform for data integration **(Q2/3 2015)**

Ultimately, the GWC aims to contribute to the future of WPM by establishing a comprehensive and dynamic database of global water points that can be used to improve learning and assist in decision making.

Questions for Brian

Q: One of the biggest issues is how to deal with conflicts, for example around coordinates. How do you do a quality check?

Short of going to whatever location has been identified, it is tricky to state correct data with 100% confidence. There are certainly data quality issues with some of the databases included, particularly with government data sets (for examples some provided wrong GPS coordinates as the points were actually in different countries). It is recognized that there are many different data needs with different quality thresholds. Depending of the data type required, the database can be filtered by the source (government, NGO, etc.). The dataset is valuable to gather ballpark figures (i.e. average functionality). Basic algorithms can assess confidence levels for the updated data.

The data quality is improving as we're moving from paper to mobile data collection, the main goal of this platform is to make data accessible. Beyond this, the user should assess the quality of that data and interpret it according to their needs.

Q: You have 12 different data sources, presumably with different databases and structures, but you have adopted just one standard. Do you take into consideration the structure of the database that is already set up by national water services of each country?

The last GLAAS report showed that the majority of countries do not yet have functioning management information systems. GWC has discussed with managers of databases in those countries where complete databases are present. The aim of GWC work is to supplement and complement the existing databases, so the interoperability with these is under consideration, for example with the development of APIs that allow the databases to be used together.

In each country, the national databases have been developed independently of one another and with different indicators, so to combine the dataset together, the most common attributes that the majority of these databases are collecting were analysed and used for the GWC database standards.

At the core level, the standards developed are completely interoperable with other databases because they often include the same information in different structures.

Q: Where have you obtained the data?

Data was acquired from different sources. For the pilot, online scouring for public data was done. Data is available but often difficult to find and only available on an intermittent basis and in hard to access formats.

For the attribute selection, we had a better response from organization asking for the indicators that were collected rather than for full data sets to avoid privacy issues.

Future:

From Rights to Results for Rural Water Services: Evidence from Kenya

Speaker: **Rob Hope**,
University of Oxford

‘New [performance-based] funding logic requires better data for verification.’
Rob Hope, 2014

A smart handpump has a GSM transmitter securely fitted in the handle of the pump. The transmitter automatically sends data on handpump water use via SMS over the mobile network. A user interface provides immediate performance metrics. The transmitter is small and robust with no moving parts. Installation is simple, enabling it to be retrofitted to existing pumps in the field or built into new pumps prior to deployment.

Remote water point monitoring

Rob Hope from the Water Program at the Smith School of Enterprise and Environment of Oxford University shared the experience of using smart handpump technology in rural Kenya in 2013 (where communities are expected to cover financially for water point maintenance). A smart handpump has a transmitter in the handle of the hand pump that records data during handpump movements. It tests this as part of a regular mechanism and provides hourly data on actual consumption of water from the “smart hand pump” water source (with volumes indirectly calculated).

Smart handpumps project aims at providing continuous and objective metrics of water service performance, contributing to more accurate and timely monitoring of service delivery, remote surveillance of performance based contracts, inform sector planning and sector accountability. They allow for better, more open access to data which can be used in improved infrastructure planning and investment.

Program background

Rob discussed the pilot project in the Kyuso District of Kenya, a very poor and remote area with low mobile network coverage. The idea was to develop a viable system in a highly challenging area in order to increase the likelihood of addressing all problems and having success elsewhere.

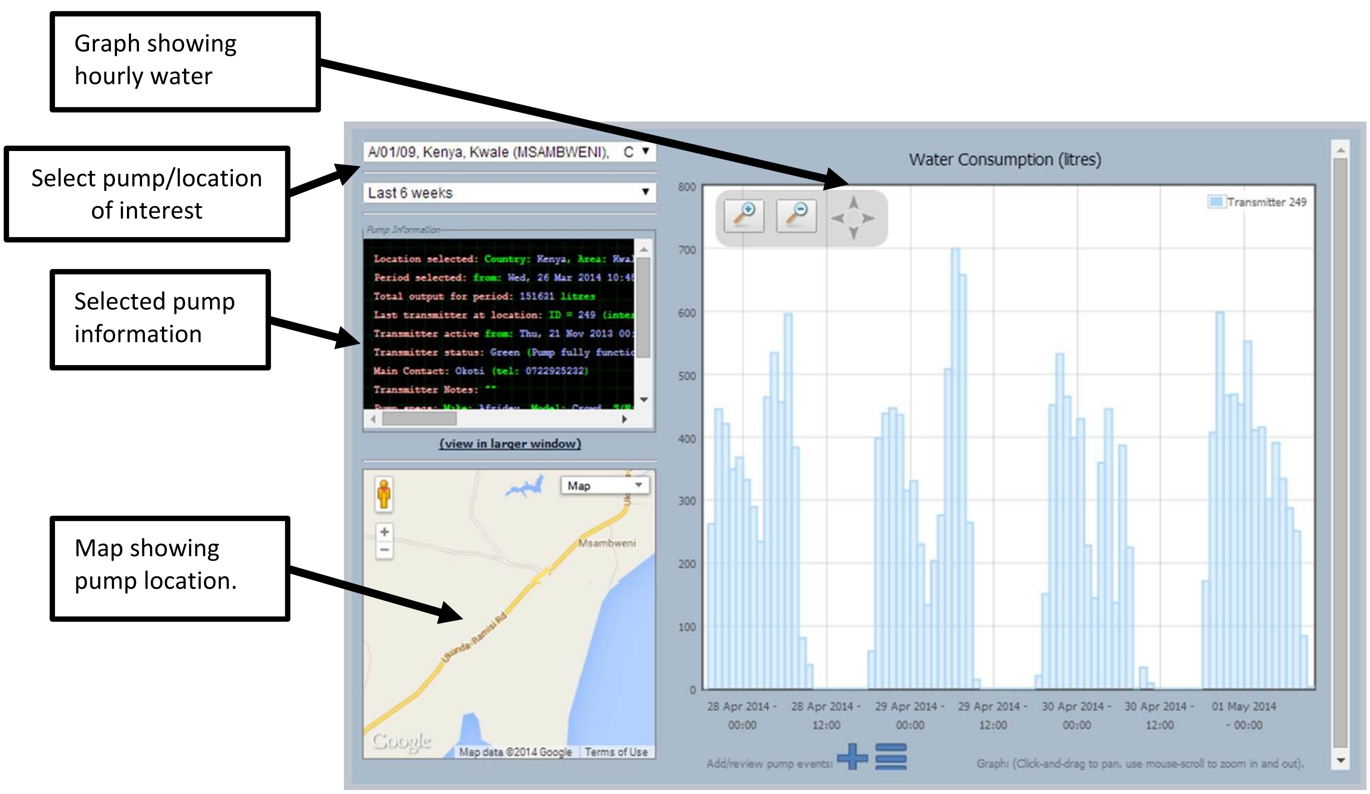
The pilot project operated based on a maintenance service provider (MSP) model, which is performance-based and scalable. Community support was obtained for trial and performance payments, and smart handpumps were clustered and monitored at scale. The MSP was trained and mobilized. The program was designed to align with local and national policy and water service regulation, which further enabled it to be replicated at scale.

The program monitored operational functionality (aiming at reducing downtimes), financial sustainability (aiming at analyzing the contingency of payments wit service delivery) and institutional transformation (around output-based payments and monitoring & regulations). Data on functionality was collected both by on-line sensor and crowdsourcing (community informing on non-functionality).

Data findings

Results from the Kyuso project, which took place from January to December of 2013, showed a great reduction in handpump downtime and an improved metric of 98% functionality for hand pumps. The system implemented a more flexible payment model that was contingent on service delivery, and users (responsible for the maintenance of the water point) were more willing to pre-pay and to pay more for handpump usage when the service delivery was proven. This led to a revised financial architecture and provided objective metrics to guide reform policy on water services.

The mapping of data included objective measurements of service delivery beyond simply water access and analysed over time and space, highlighting huge variations in water point usage. Unit cost of water production (annual handpumps repaid cost per m3 of water used) was monitored to inform infrastructure management. The interface of the program used to map data collected from smart hand handpumps provides information on water consumption on a daily, weekly and monthly schedule. A specific pump or location can be specified and specific information selected. It also features a zoomable map of the pump location.



The significance of this data in water point monitoring and maintenance and in decision-making was emphasized. As example, its use for the predictive statistics around the relationship between rainfall and waterpoint usage, as during periods of heavy rainfall users are more likely to use ground sources than hand pumps, a trend which has policy implications.

Next steps

The initial success of the smart handpump technology and management system is encouraging, but the next stages will require further planning around a sustainable institutional design. Challenges with local government response are still present, so the need for a separation of legal, policy and delivery functions in this mapping model was emphasized. The respective roles of stakeholders will need to be redefined, and independent nation regulating body should be in place (to regulate independently government, NGOs and university working in the sector for performance control).

Another key planning factor is around financial sustainability, as with all models. Sustainable financial coverage has received more attention but plans for it are still insufficient. Output-based Aid (OBA), which is the concept of **Payment by Results**, is an emerging funding logic that requires independent data for verification.

>Emerging Trend<

Payment by Results

This instrument for investment policy operates on a performance basis. Projects receive funding payments based on verified data and outcomes.

More information

Smart Handpumps – reports, papers, blogs, video: http://oxwater.co.uk/
Water Programme, Smith School of Enterprise and the Environment:
http://www.smithschool.ox.ac.uk/research/water-programme/
Contact: robert.hope@smithschool.ox.ac.uk

Questions for Rob

Q: What is the price of a device? What kind of maintenance is needed and battery life?

The price of the first device was around $300, but this was a highly outfitted version. The next model being installed is around $185. The price is dropping significantly as scale increases.

The battery life at the moment will last over 2 years, and replacement is fairly straightforward. The handpumps in study sites are generally repaired twice a year on average.

Batteries were chosen rather than solar panels because such alternative energy sources face many maintenance and reliability challenges. For purposes of the study, batteries were determined as the simplest and most effective solution at the moment.

Q: How do you safeguard against theft and who is responsible for buying the device?

Two out of 66 handpumps were damaged during the one year trial in Kyuso. In other study sites of 300, the only incident was one where one handle was taken by another NGO. There hasn't been any significant problem with security. It is believed that this is because the programme is dramatically improving service delivery in these communities (by reducing downtime) and therefore brings a large measure of self-regulation in communities.

Q: What is the financial study you are going into now? To what extent does the consideration of alternative sources correlate with payment by communities for services? How does that affect your maintenance?

This goes back to World Bank rural water research from the 1990s. One of the key conclusions from the multi-country study they led was that alternative supplies determine the extent to which people are willing to pay for an improvement in services. There are alternative sources in the area of our study, e.g. rainwater harvesting, submersible pumps, kiosk etc. and this determines the extent to which people demand services from handpumps over space and time- this information needs to be clearly understood by the service provider. Another important aspect is the spatial distribution of handpumps and its impact on the willingness to pay (ie. there are areas with solitary handpumps and others with as much as five in one geographic situation as a result of the accessibility and ease of installing in the area). It was observed that this affected willingness to pay as with increasing number of head pumps reducing the willingness to pay.

The programme is now looking at implementing a mobile payment system that requires pre-payment to see what impact it has on the financial system. This will likely be tested in 2015.

Community:
https://dgroups.org/rwsn/mapping/join

Presentations & Recordings:
http://www.rural-water-supply.net/en/resources/details/615

Full webinar series on rainwater harvesting, groundwater research and water point mapping (RAIN - UPGro - WaterAid - IRC - RWSN)
http://www.rural-water-supply.net/en/projekts/details/79

RWSN WaterAid IRC Supporting water sanitation and hygiene services for life