33rd WEDC International Conference, Accra, Ghana, 2008

ACCESS TO SANITATION AND SAFE WATER:
GLOBAL PARTNERSHIPS AND LOCAL ACTIONS

Quality and sustainability aspects in water access indicators: an example from Same District, Tanzania

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Vital aspects in water supply, such as quality and reliability (or vulnerability) of the service have been overlooked up to date in the definition of the term 'Access' when used as a sector indicator. As a rule, governments at all levels are ignoring them and no investments are made accordingly. This paper describes the experience of the Spanish NGO Ingeniería Sin Fronteras (Engineering Without Borders) on considering both aspects in a pilot project implemented in Same rural District, Tanzania. Based on the water point mapping methodology, basic water quality tests were included during the campaign and seasonality questions were also processed. The study aims to provide an example of to which extent improved water points do provide safe water; while considering year round functionality as a key aspect if the service wants to be sustainable. New indicators are proposed and results discussed. Last section concludes providing information on the opportunities, costs and challenges of including this additional information when access indicators are to be used.

Introduction: Water point mapping and access to water

Water Point Mapping (WPM) can be defined as an "exercise whereby the geographical positions of all improved water points in an area are gathered in addition to management, technical and demographical information. This information is collected through GPS and a questionnaire for each water point. The data is entered into a geographical information system and then correlated with available demographic, administrative and physical data. The information is displayed via digital maps" (WaterAid, ODI, 2005). This methodology has been developed and widely used by the International organization WaterAid in several countries (Wateraid, 2007), and it seeks to serve two different purposes:

- To easily show the distribution of water points in the territory. This should enhance efficiency and transparency in local government's planning while enabling a higher degree of accountability towards population.
- To allow the definition of more reliable access indicators, which are to be constructed from the lowest geographical level with available data.

At the same time, the Millennium Development Goals, target 10, advocate for increasing the "sustainable access to safe water", thus covering three different but related aspects:

- Access, which include "physical access", defined in national policies by establishing a maximum distance to a water point and/or the number of people served by a water point; and "socio-political access", focussing on issues such as affordability of the service, inclusivity and equity.
- Quality (safe). Potable water is defined in each country through national quality standards, thus varying among them. Nevertheless, the concept of safe water is not being measured up to date by indicators per se, but in an indirect way, since it is assumed that improved sources are supplying safe water.
- Functionality of the service (sustainable): Sustainability is a wide and complex concept, which is made up of many interrelated components, including the environmental, social, political and economical context and the institutional arrangements for service management (Harvey et al. 2004). With regard to a water system, it points out the ability of the service to provide a reliable and adequate water supply in the long term.

Joint Monitoring Programme sets the indicator for target 10 as the number of people having "access to improved" water sources (WHO/UNICEF, 2000, 2005). With regard to this definition, "access" is usually assessed through household surveys, thus relying on personal interpretation about what appropriate "access" should mean and far from providing objective evaluations, as police provisions state. In contrast, though "improved" water sources are better defined (WHO/UNICEF 2005), the coverage figures produced by technology indicators do not give enough information about neither the quality of the water provided nor its use (WHO/UNICEF, 2000). Finally, no information is reported about the sustainability of the service.

As previously mentioned, Water Point Mapping can provide an accurate approach to physical access to water, since it informs about the functionality of all water points in an area. Nevertheless, this is not the only valuable information which should be taken into consideration. This paper thus focuses on some improvements proposed to this WPM methodology by Ingeniería Sin Fronteras. These have been tested in Same District, Tanzania; and are mainly based on including basic measures of the quality of water in the mapping campaign. The target of including quality measurements is twofold. First, to provide an example of to which extent it is believed that improved water points provide safe water; secondly, to have a first experience on the difficulties and challenges of including this component in the Water Point Mapping. A simple way of assessing water stress in the dry season is also provided. Results in Same District are presented and discussed; and main challenges and justification for implementing this improved WPM are discussed in the conclusions.

Improvements proposed on the water point mapping

ISF Water Point Mapping is mainly based on WaterAid experiences in Malawi and Tanzania (WaterAid, 2007). However, to include water quality measurements in the routine brought significant variations in both the resources required and within the field team formation, which was finally made up of the following components:

- 1 technician from District Water Department (DWD).
- 2 technicians from Geodata Consultants, Tanzanian company contracted by ISF for field data collection and processing.
- 2 extra staff in charge of making the water quality tests. In this case, 3 young engineers working voluntarily (only 2 at the field) made the tests.
- Village Executive Officer of each village, making the link between the mapping team and the community.
- The equipment needed included:
- GPS to locate water points
- Digital Camera, as one picture was taken from each water point
- Digitiser, to convert hard-copy district maps into digital form.
- Computer for data processing.
- Oxfam Delagua Kit for quality testing.
- Portable fridge to keep culture medium cool.
- 4 wheel drive vehicle for transport across the District.

In essence, the information was collected from each improved water point trough a questionnaire (see Table 1), including the following:

1. General information about each water point, including type of water point, condition (functional, not functional, stolen, under repair), and if belonging to a Water system, a brief description about it.
2. Management information, including institution in charge and its main features , seasonality of service, incomes and expenditure, and users perception of quality, quantity, etc.
3. Construction information: year, funding agency and installer.
4. Maintenance information: number and frequency of breakdowns, reactivity, etc.

Apart from the questionnaire, Water Point Mapping campaign was completed with basic quality analysis. The tests were made with the portable Oxfam delAgua Kit; and turbidity, chlorine, pH and concentration of thermo tolerant (faecal) coliforms were all measured in each water sample (OXFAM, 2004). Measures were taken following these criteria:

5. For network water systems, quality was tested at two different points of the net (usually the tank and one distribution point). It is presumed that these results can be applied to the whole network; though if the network was small, only one point was tested.
6. For individual water points, independent tests were executed.

Total field work lasted 29 days. In brief, 723 water points were mapped, in an extension of 5,186 km^2, and 138 water quality tests were undertaken.

Table 1. Survey questionnaire

1. Geographic:
1.1. District Name: _
1.2. Ward Name: _
1.3. Village Name: _
1.4. Village Reg. Number: |_ _|_ _|_ _ _|
1.5. Village Office GPS Coordinates:
X - Coord.: |_|_|_|_|_|_|_|_|
Y - Coord.: |_|_|_|_|_|_|_|
1.6. Sub-Village Name: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

2. Water Point:
2.1. Water Point /Borehole number: |_ _ _ _ _|_ _ _ _|
2.2. Water Point Name: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
2.3. Water Point GPS Coordinates:
X - Coord.: |_|_|_|_|_|_|_|_|
Y - Coord.: |_|_|_|_|_|_|_|
2.4. Way Point Number: |_|_|_|_|_|_|_|_|
2.5. Elevations: (M) |_|_|_|_|_|_|_|_|
2.6. GPS - Equip No : |_|_|_|_|_|_|_|_|_|
Name: _
2.7. Surveyor's name:
_ _
2.8. Record Date: |_ _|_ _|_ _|
2.9. WPT Contact Person:
_ _
2.10. Population using WPT : |_|_|_|_|
2.11. Quality sample collected: (Y/N) |_|
2.12. Quality Sample Number: |_|_|_|_|_|

3. General Information on Water Point:
3.1. Water point type? |_|
1.- Mechanic borehole & hand-pump
2.- Hand drilled tube-well & hand-pump
3.- Shallow well & hand-pump
4.- Gravity Fed communal standpipe
5.- Gravity Fed communal standpipe multiple
6.- Motorised communal standpipe
7.- Motorised communal standpipe multiple
8.- Dam
9.- Protected spring
10.- Others: _

3.2. Existing pump type? |_|
0.- No pump 5.- Nira / Tanira
1.- Afridev 6.- SWN 80
2.- Climax 7.- Walimi
3.- KSB 8.- Windmill
4.- Mono 9.- Other: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

3.3. Today's Condition? |_|
1.- Functional
2.- Not Functional
3.- Stolen
4.- Under Repair

3.4. Structure that exist and need repairs
(1 - Good cond. 2 - Light repair & 3- Heavy repair):
1.- Apron |_|
2.- Drainage |_|
3.- Washing slab |_|
4.- Soak pit |_|
5.- Fence |_|
6.- Embankment (dams only) |_|

3.5. Type of service of WP |_|
1.- Private
2.- Community
3.- School
4.- Dispensary/Hospital
5.- Others:_ _

3.6. Existing flowmeter: (Y/N) |_|

3.7. Time (minutes) to fetch water (HH-WP-HH):
1) Person 1: |_ _ _|
2) Person 2: |_ _ _|
3) Person 3: |_ _ _|

3.8. Average water consumption (liters per person per day):
1) Person 1: |_ _ _|
2) Person 2: |_ _ _|
3) Person 3: |_ _ _|

4. Management:
4.1. Is water point part of scheme? (Y / N) |_|
If yes specify the name: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

4.2. What type of management organization is there? |_|

1.- Water User Group (WUG)
2.- Water User Association (WUA)
3.- Village water committee
4.- Trust
5.- Company
6.- Board
7.- Private
8.- Others : _

4.3. Has there been a public meeting to discuss income and expenditure in the last year?
1.- Unknown
2.- No
3.- Yes

4.4. Was there any income last year?
1.- Unknown
2.- No
3.- Yes
If yes mention amount Tshs. _ _ _ _ _ _ _ _ _

4.5. Was there any expenditure last year? |_|
1.- Unknown
2.- No
3.- Yes
If yes mention amount Tshs. _ _ _ _ _ _ _ _ _

4.6. Community perception regarding water quality? |_|
1.- Clear
2.- Salty
3.- Milky
4.- Coloured
5.- Fluoride
6.- No answer

4.7. Community perception regarding water flow? |_|
1.- Enough
2.- Poor
3.- Seasonal
4.- Dry
5.- No answer
6.- Others/ Comments: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

In case of seasonal problems:
4.8. Seasons of no flow (match the months):
J F M A M J J A S O N D

4.9. Type and place of alternative source during water-non-available seasons:
_ _

4.10. Time (minutes) to fetch water (HH-WP-HH) at alternative source: 1)|_ _ _| 2) |_ _ _| 3)|_ _ _|

4.11. Average water consumption at alternative source (liters per person per day): 1)|_ _ _| 2) |_ _ _| 3)|_ _ _|

5. Construction:
5.1. When was water point installed? |_|
1.- Under construction
2.- Unknown
3.- Known
If known which year |_|_|_|_|

5.2. Who funded the water point? |_|
1.- Unknown
2.- Known
If known mention : _ _ _ _ _ _ _ _ _

5.3. Who installed the water point? |_|
1.- Unknown
2.- Known
If known mention : _ _ _ _ _ _ _ _ _

6. Maintenance
6.1. When was the last water point problem? |_|
1.- Never had a problem
2.- Unknown
3.- Known
If known which year |_|_|_|_|

6.2. Was it first time? (Yes / No) |_|

6.3. What was the problem?
1.- Pump: _
2.- Water dried up: _
3.- Tap: _
4.- Lines: _
5.- Other: _

6.4. Status of who repaired is known? |_|
1.- Not yet repaired
2.- Unknown
3.- Known
If known mention the name: _ _ _ _ _ _ _ _ _ _ _ _

7. Water Schemes:
7.1. Number of private connections: |_|

7.2. Water tank GPS coordinates:
X - Coord.: |_|_|_|_|_|_|_|_|
Y - Coord.: |_|_|_|_|_|_|_|

7.3. Water tank condition: (Y/N)
1. Not functional |_|
2. Leakages |_|
3. Protection of fence |_|
4. Overflow |_|
5. Washout |_|

7.4. Water tank capacity: |_ _ _|

7.5. Quality sample collected: (Y/N) |_|

7.6. Quality Sample Number: |_|_|_|_|_|

8. Comments: _
_ _
_ _

Results

Access

Improved Community Water Point (ICWP), as defined by WaterAid methodology (Stoupy and Sudgen 2003), is considered as a place with some improved facilities where water is drawn for various uses such as drinking, washing, cooking, etc. The types of water points considered as Improved are in concordance with those internationally accepted (WHO/UNICEF, 2005).

As it has been previously explained Access is normally defined by establishing a maximum distance and people served ratios to each water point. In Tanzania, for example, the National Water Policy defines one water point for 250 people within 400 m. Then, once suitably defined, percentage of access in an area can be accurately assessed. The first access indicator defined is the Improved Community Water Points Density, ICWPD, equal to the number of ICWP per 1000 inhabitants (Stoupy and Sudgen 2003). In this respect, based on the Tanzanian standards, a certain area is considered to have appropriate access if its density is at least equal to 4. Likewise, the percentage of people unserved in a given area would be proportional to the lack of water points needed to reach this threshold. However, ICWP can be easily further improved, since functionality information for each water point is also collected during survey. The difference between in place water points and functional ones can amount more than 30% (Government of Tanzania, 2002), thus it is an important fact to consider. As a result, the Functional Community Water Points Density, FCWPD, is used by Wateraid as the real access indicator (Stoupy and Sudgen 2003).

Figure 1 shows the FCWPD for Same District by the end of 2006. Information is displayed by ward, amounting 10.000 to 20.000 people each. Legend is displayed to identify ward access status by colour: red represents the most underserved (less than 1 FCWP/1000 people), while dark green colour represents wards with more than 4 FCWP/1000 people (above official threshold for access). Intermediate colours are orange and light green. Potential of this methodology to identify underserved areas and improve planning is obvious.

It is worth to recall that population with access to water in Same District using this methodology is 42.74%, a sensibly lower value than that stated throughout household surveys, which increases access up to 51.64% (Tanzania Ministry of Water, based on Household Budget Census 2002).

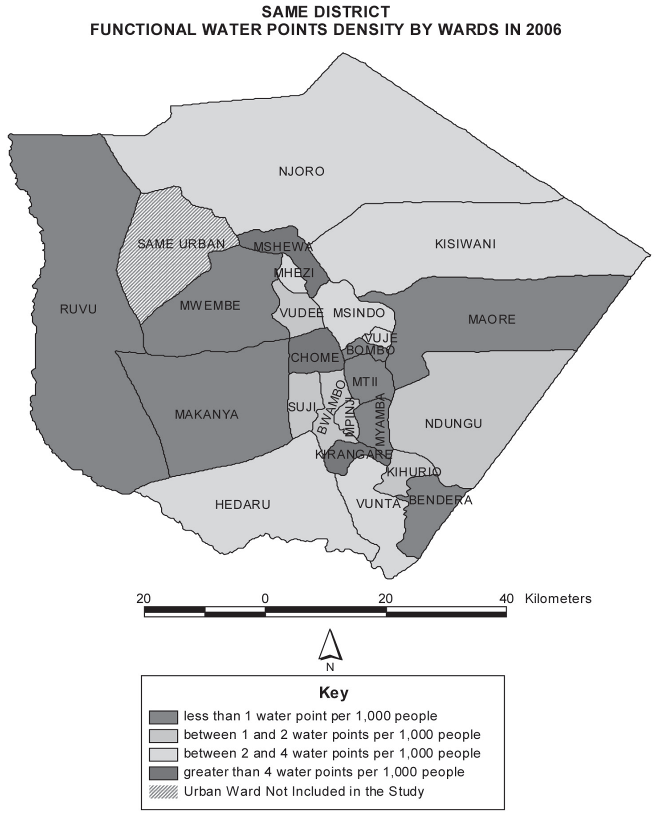

Figure 1. Functional water point density in same district

Source: Produced by Geodata S.L. under private contract with ISF-Tanzania, 2006

Safe access

With some data collected regarding to quality aspects, the Bacteriological Safe Water Point Density was further defined, meaning the amount of functional water points providing water with acceptable faecal coliform presence at the time of the test. In this case, the threshold has been established following Tanzanian quality standards, at 10 faecal coliforms/100 ml. Out of 138 water quality analysis, 42% had some type of faecal coliform, including 31% of the surveyed tanks. 20 villages out of 67 had quality problems in their systems. Extrapolating results as explained before, only 306 water points supplied acceptable quality water out of 403 functional ones, meaning that faecal contamination (10 faecal coliforms/100 ml) was reported in 24% of water points. With regard to the type of technology 40% of hand pumps, 26% of gravity water points and 22% of protected springs were providing contaminated water. In brief, access to bacteriological safe water reduces coverage from 42.74% (if only functionality is considered) to 31.37%.

Year round access

The fact of the guarantee of service provided is up to date overlooked in current indicators. In this first approach, seasonality of water points, as reported by water users, has been analyzed; establishing that one water point is not considered as year-round functional if water users report a seasonality of more than one month. Then, one can define the Year round Functional Water Point Density, which in Same District resulted to be of 30.78%, compared to the 42.74% when only functionality criterion was considered.

In this respect, although measuring seasonality is not enough to assess sustainability of services, year-round service should be a necessary condition for it. Moreover, seasonality provides significant information about vulnerability of the service to climatic conditions (dry seasons), while shows (current or potential) conflicts in water uses allocation. This might have enormous importance in some areas. For instance, Same District suffered severe problems related to droughts in 2006 (The Guardian, 2006); and though the most affected villages were those having some kind of access to water, it was shown that they relied their supply on vulnerable sources (Same District Water Department, 2006).

Year-round functional and safe water access

If both quality information and seasonality are considered, a single indicator can be defined as the Bacteriological Safe and Year-round Functional Water Point Density. Using this indicator in Same District, water access coverage is reduced to 25.29%.

Table 2 summarizes the indicators provided by central governments, WaterAid Water Point Mapping and ISF proposal. Bold face means the access indicator used by each methodology. The third column shows the results obtained in terms of access coverage for the specific case of Same District. Data shows that difference in the coverage percentage obtained is significant. In essence, including basic quality and seasonality components in the indicator reduces coverage in 17% compared to functional water points, and cuts into half the national value obtained for Same District.

Table 2. Comparison among different methodologies and access indicators provided, Same District results, 2006

Methodology	Indicators provided	% access
Governmental household surveys-	**Aggregated access indicator**	**51.64%**
WaterAid water point mapping	Improved community water points density	75.02%
	Functional improved community water points density	**42.74%**
ISF water point mapping-	Bacteriological safe functional ICWP density-	31.37%
	Year-round functional ICWP density-	30.78%
	Bacteriological safe and year-round functional ICWP density	**25.29%**

Discussion

The issue of costs

As it has been previously mentioned, quality tests were performed at the same time than the mapping process, thus enabling to use same transport and same visits to water points. Only quality test's equipment and additional human resources have to be considered as extra costs. After WaterAid experience, WPM costs around 10USD/point in Malawi and in Tanzania, and roughly 7500 USD/District regardless its extension (WaterAid, ODI, 2005). Amounts between 600-1000 Water points per district can be estimated for Tanzania, giving a cost between 8 and 12 USD per point. In year 2006, 10,000 USD were paid for Same District mapping (13.83 USD/Water point), excluding costs of quality analysis. These could be splitted into the following:

- 1 Oxfam DelAgua Kit and consumables: 2,800 USD (consumables can be estimated at 0,6 USD/test)
- 1 portable refrigerator: 50 USD
- Allowances for 2 extra people for quality sampling 30 days (25 USD/day): 1,500 USD

Thus, extra cost for quality testing can be estimated at 4,350 USD for this case study, amounting 6 USD/Water point, 40% more than WPM without quality test. Nevertheless, it must be considered that water kit can be used for more than one district, thus extra costs would be considerably reduced (almost halved) if methodology is up scaled.

Some other aspects to be considered

- Access to water points is not always simple and water kit remains a heavy instrument. This complicates the quality measurements in some points.
- When absences from base office are long, refrigerated conservation of medium has to be foreseen, with portable cooling devices and electricity supply.
- Culture medium is not easily available. Enough stock has to be in place before starting the campaign.
- Previous rough information about number of water points per village improves planning and can save some days of field work.

Conclusions

Water Point Mapping is a widely used tool for acquiring reliable information on water access. Nevertheless, up to date it does not cover other important "access" aspects such as quality of water or vulnerability of the service. The experience of Ingeniería Sin Fronteras on including basic measurements of both aspects in a pilot experience in Same rural District, Tanzania, shows some interesting results. First, there is a significant difference between the number of functional water points and those which additionally provide bacteriological safe water. 42% of Improved Water Points provided water with some kind of coliform, and 24% were above 10 coliform/100 ml. Coverage is reduced from 42.74% to 31.37% if quality aspects are considered. In terms of costs, an increment of around 40% to standard WPM can be expected. That means 35 TZS/person in Same, compared to the 21,475 TZS per capita of Same District budget in 2006. Similarly, at national level, the WPM in 122 districts, including quality tests, would roughly cost around 1.8 MUSD; which though it might appear high, it is not compared to the 950 MUSD that will be invested in the sector from 2007 to 2011, being at least 800 MUSD committed to the increase of service delivery both at rural and urban areas.

Additionally, seasonality questions have been processed to assess vulnerability of the service. As a result, one water point is considered to give year-round service if seasonality reported from users is not higher than one month. Thus, year-round functional and bacteriological safe water point's density can be obtained. This "improved" indicator provides information about the real access to water in critical periods. Results in Same District decrease coverage to 25%. This information is relevant to dry areas which are supplied by vulnerable sources, or where conflicts between water uses occur, as Same itself.

To sum up, this study is aimed at underlining two facts. First, to highlight that quality and security components of the supply are often sidelined in sector indicators currently used. As a result, both aspects are not included in sector investments at all levels. Water Point Mapping represents an excellent opportunity to tackle all these issues and provide additional important information to local governments. . Secondly, presuming that improved water sources are supplying safe water might be too optimistic and even dangerous, thus further evidence is needed in order to adopt effective safe and sustainable water access indicators.

Acknowledgements

The author/s would like to extend thanks to Ingeniería sin Fronteras, Universidad Politécnica de Madrid and Universitat Politècnica de Catalunya, for their support to undertake the mapping project; to WaterAid Tanzania, for their continuous assistance during the process. Research grant provided by the Generalitat de Catalunya, ACCD-U2006, is also acknowledged. Special thanks are also given to ISF-Same staff and to Josep Costa, Ángel Fernández, Laura Montilla, Jordi Pascual, Carol Puig and Adrián Suárez for their dedicated work during and after mapping surveys, and to Ricard Giné, for revising the text. Same District Water Department collaboration is also gratefully recognized.

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Keywords
access, mapping, quality, indicators, monitoring

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