Indicators for the water sector: examples from Malawi

FIELDWORK REPORT

Paper written by:

Steven Sugden,
WaterAid Country Representative,
Malawi

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Introduction

The Millennium Development Goals set to halve the proportion of people lacking access to safe drinking water and sanitation by 2015 present huge challenges to the international community.

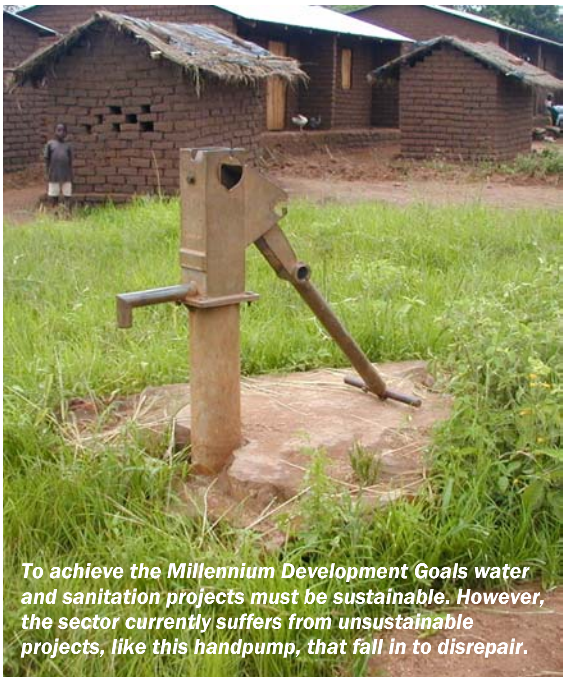
To attain these targets it is vital that there is accessible, accurate and reliable water and sanitation data available that is routinely collected and stored. Data and basic indicators collected through local and national surveys form the basis of future plans and activities for actors in the water sector. However, these are currently limited, inaccurate and dissipated. More accurate data and more detailed indicators are therefore needed to help inform future plans and projects.

This paper outlines sets of indicators that can be used to help the planners and managers in the water sector plan and implement sustainable projects that reach those most in need. The first is a simple yet effective set of indicators for assessing the sustainability of a water supply programme that has been tested by WaterAid in Africa.

The second indicator is the 'Equity in Distribution Indicator' developed by WaterAid in Malawi. This measures the degree of equality within an area and could become a powerful tool in assessing whether a district, region or country is effectively focussing its resources to those without services. It estimates the actual cost of poor co-ordination within one district in Malawi.

A sustainability indicator

Sustainability has become one of the most over used and abused words in development vocabulary. Many organisations working in the rural water sector claim to be providing sustainable water points, but it is questionable whether they actually are. The water and sanitation sector suffers from unsustainable projects that fail into disrepair. Organisations often make too many assumptions and have unrealistic expectations of what community maintenance systems can deliver. Five days' training in community based management and a shop in the nearest town selling spare parts do not guarantee sustainability. Challenges still outweigh solutions and, as such, it may be time to re-think the approach.
Perhaps a better way to achieve the Millennium



To achieve the Millennium Development Goals water and sanitation projects must be sustainable. However, the sector currently suffers from unsustainable projects, like this handpump, that fall in to disrepair.

Development Goals is to do nothing for the next ten years and then in 2013 invest huge sums of money drilling boreholes in the poorest countries of the world. In this way there is a better chance that the facilities will still be operational in 2015 and that the millennium goal will be achieved. While this is of course a nonsensical argument, it highlights why sustainability is so important. There is little point in working to halve the proportion of people without access to safe water by 2015, if by 2016 all the services that have been installed are broken.

In most new rural water supply projects handpumps are chosen as the preferred technology. However, the life expectancy of an Afridev handpump is estimated at 10-14 years. When considered, this means that not only will massive investment be needed to provide water points to those currently unserved, but it will also need massive investment and capacity to replace the ones that have reached the end of their natural lives. It is a sobering thought that every handpump installed since 2000 will need to be replaced before 2015 in order to reach the Millennium Development Goals.

One of the keys to achieving the millennium goals must therefore lie in the ability of communities, or organisations, to keep their water facilities operational. As such an indicator that reflects the likely sustainability of supplies

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The international NGO dedicated exclusively to the provision of safe domestic water, sanitation and hygiene education to the world's poorest people.

Box 1 What is understood by Demand Responsive Approach (DRA)?

As part of a survey in Malawi, all the leading implementers of rural water projects were asked what they understood by DRA. The most common reply was simplistic and incorrect, along the lines of: “The communities make a demand, we respond”.

The Director of Water Services at the Ministry of Water Development replied “It means different things to different people at different times”. While this is no doubt a correct answer, it is not one that gives a great deal of guidance.

In addition an officer on the World Bank funded National Water Development Project replied “That’s a difficult one”.

seems crucial when planning future projects.

Much work has been carried out on improving and standardising handpumps and this has no doubt led to improvements in the number of breakdowns and the ease with which they can be repaired. Adopting a demand- rather than supply-driven policy may also have an impact on sustainability, but the accompanying Demand Responsive Approach (DRA) still seems to be source of much confusion as is demonstrated in Box 1.

This point is reiterated by WEDC (Water, Engineering and Development Centre) in a report based on research into the sustainability of handpumps in Africa. The report states that: *‘Current handpump projects in Africa are failing because there are large gaps in knowledge and understanding of the design and management of projects at all levels in stakeholder organisations.’*

It was this lack of clarity about what makes a project sustainable, and a concern that WaterAid programmes were not focussing sufficiently on this very important issue, that led to the idea of developing an evaluation tool that would help project managers focus less on the implementation aspects of their work and more on the sustainability. For the tool to be effective it had to be:

- Easy to understand and use
- Quick
- Discussion provoking
- Applicable to all circumstances
- Non-prescriptive
- Effective even in exceptional circumstances

The ability of a community to keep a water point operational over a long period of time is a complex mix of managerial, social, financial, institutional and technical issues. Each of these elements is often dynamic, inter-linked and inter-dependent.

After several attempts a tool called the sustainability snapshot was created, based on the idea of developing a continuum of possible answers to a simple question such as ‘Does the community have access to spare parts.’ The tool was called a snapshot in order to emphasise that the sustainability of a water point is dynamic, and to highlight the ease with which the tool can be used to analyse complex sustainability issues. Rather than evaluating water point sustainability, it sets out to highlight key issues that may be undermining sustainability across a region, district or country.

The sustainability snapshot

Using the snapshot tool is simple. Whoever is evaluating the potential sustainability of a project has to decide which of three phrases is most applicable with regard to whether the community:

- has the funds to carry out repairs
- has access to the skills to carry out repairs
- has access to the necessary spare parts and equipment to carry out repairs

The respondent has to decide which of the following statements is applicable in each category:

<u>Financial</u>

Which of the following is applicable to the type of water point in question?

1. No funds available for maintenance when needed
2. Funds available but not sufficient for the most expensive maintenance process
3. Funds available and sufficient for the most expensive maintenance process

<u>Technical skills</u>

Which of the following is applicable to the type of water point in question?

1. Technical skills not available for maintenance when needed
2. Some technical skills for maintenance, but not for all
3. Technical skills for all maintenance processes available

NB Available in this context means available to an average community member within a reasonable time.

<u>Equipment and spare parts</u>

Which of the following is applicable to the type of water point in question?

1. Not available when needed
2. Available but not for all repairs
3. Available for all repairs

The analysis is equally simple. If the response is:

- 1 – the handpump is unlikely to last beyond its first breakdown
- 2 – the handpump is unlikely to last beyond its first major breakdown
- 3 - the handpump is likely to be sustained

When used as an evaluation tool, the most appropriate phrases for all three issues are decided and the respondents are then asked to justify their responses. This tends to make people assess why they gave certain answers and whether they know and understand the real situation in the communities.

The last part of the snap shot process is to help people decide their next steps. If that includes a survey to help them get a better understanding of the situation of which phrase applies, then the process has been successful, as it has started to make people prioritise sustainability and move the focus away from implementation.

While the snapshot can be used at project level, it is perhaps better used at a broader level, such as a district, local government area or even provincial or state level. The idea is not to do a detailed evaluation of each water point but rather to step back and ask whether the foundations for project sustainability are generally in place. For example are spares available at district level? Do communities within the area collect funds? Do the technical skills exist to repair a certain technology? If the answers to these questions are consistently 'no' then planners need to identify ways to improve the environment or must reconsider the technology.

At the end of the process the sustainability snap shot score may look like this:
With such a result a manager or government

Technology	Borehole with handpump
Financial	2
Technical skills	1
Spare and equipment	2

officer may decide that the lack of technical skills is the main impediment to sustainability and initiate work in this area.

Undertaking the sustainability snap shot

Stage 1: The aim of stage one is to undertake a quick evaluation of a community's ability to maintain the types of water point that could be installed. Responses are then collated for the three questions outlined on page 2.

The sustainability grid below is completed for each type **of water point:**
Stage 2 – Comments: Given the ranking

Project name			
Technology	Hand-dug well with pump	Rural piped scheme	Borehole with handpump
Financial			
Technical skills			
Spare and equipment			

determined by the above, a brief explanation is given as to why such scores were allocated.

Stage 3 – The way forward: The teams answer the following questions to establish the way forward

- Is it reasonable to aim for 'threes' in all the examples above?
- What needs to be done differently to achieve threes?
- Is this possible?

If there is a series of threes or if the project has moved recently from a two to a three, has the process been documented?

In practice all of the WaterAid programmes where it was tested gave positive responses regarding the ease and usefulness of the sustainability snapshot. The facilitators within WaterAid programmes found that the system gradually drew participants into thinking more deeply about issues of sustainability. By focussing on sustainability, issues such as the weaknesses of community financing systems came to the fore of the debate ahead of the usual issues regarding hardware. The list below was drawn from the results of the responses to the question: "What do you think you need to do differently?" The answers clearly reflect concerns over the financial and managerial aspect of water point sustainability.

- Village pump attendants to be trained to attend major repairs with little or no support from the district level
- Design the project considering other demands like livestock so that more money can be tapped from the livestock keepers particularly during dry season (when there is no other water source)
- Encourage use of private operators to manage the operation and maintenance of the scheme as it has proven to work in some of the villages
- The main hurdle to overcome is community confidence in the management of funds. It is normal for there to be no trust and assume that someone will run off with the money
- Ensure that income-generating elements are included in projects or that micro-credit facilities are available to communities
- Establish a viable spare parts supply system at the district level and extend this to catchment level; incorporate local businesses in this system rather than base it around the district water and sanitation committee or council
- Investigate potential for expanding technology choice for communities

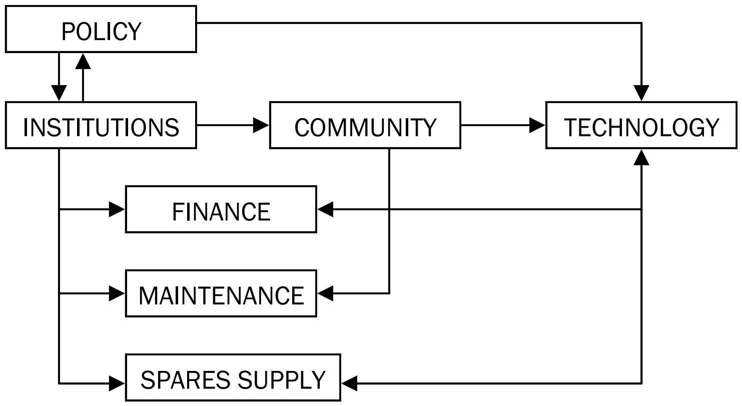
Does the sustainability snap shot a give true reflection of sustainability?

In the first phase of research into the sustainability of handpumps in Africa, WEDC identified seven key factors that were critical for achieving sustainability. These were:

- Policy context
- Institutional arrangements
- Financial and economic issues
- Community and social aspects
- Technology and the natural environment
- Spare parts supply
- Maintenance systems

WEDC arranged these factors into a sustainability

Box 2. WEDC sustainability matrix



A → B indicates that factor B is dependent on factor A
↔ Indicates mutually dependent factors

matrix in an attempt to show the relationships between each of the factors. This matrix is shown in Box 2.

As can be seen from the matrix, WEDC believes that the sustainability factors are heavily interdependent. WEDC also states that *'At the heart of the matrix, therefore, is maintenance, which has a direct impact on sustainability and yet is dependent on all the other factors.'*

WEDC have concluded that finance, maintenance and spare part supply are dependent on policy, community, institutions and technology. As the sustainability snapshot is aimed at assessing all three of these important key factors the argument suggests that if these three factors are working correctly at community level (ie the snapshot records a series of threes) then the other dependent factors must also be satisfactory. So, in practice whether a community is capable of maintaining its handpump is dependent on the policy, community, institutions and technology being correct.

The snap shot is capable of simplifying the complex, inter-related issues surrounding sustainability and can give a reasonable reflection of the sustainability of a water supply programme.

Box 3: An extract from 'Guidelines for Sustainable Handpump Projects in Africa', WEDC.

Finally, all this talk of sustainability is of little use unless it can be measured and monitored. There are some recent studies that have attempted to define analytical frameworks and indicators for sustainability. These are often quite complex and the potential for application to handpumps projects may not be great. The most exciting new piece of work is from WaterAid, which is in the process of developing a simple, user-friendly approach to assessing sustainability of handpump projects. The literature review did not find any other similar tools in existence so there is potential for WaterAid's *Sustainability Snapshot* to become widely used in the field.

The equity distribution indicator

A disenchanted villager once asked "Why does the next village have eight handpumps and we don't have any?" This was a good question and one that was difficult to answer. It had been suspected that the method of allocating resources for the improvement of water supplies was unfair and inequitable, but the exact extent of the problem was unknown. While the overall aim of the water and sanitation sector may be to achieve equitable access for all, research has shown that in practice this is not the case. In Malawi, WaterAid has found anecdotal field experiences which showed that in some communities there were handpumps every 250 metres while in others, people had to travel long distances to the nearest water point. Was this a result of an unfortunate oversight made by the planners, or was this in fact the norm for the district?

These were some of the questions that prompted WaterAid to initiate research into assessing the equity in which resources were distributed within the rural parts of the Salima District in Malawi.

Equity in distribution – what does it mean?

In a truly fair and well managed water sector there should be no difference in the levels of access to safe water between communities in a specified area. Conversely in an environment where resources are poorly managed or the decisions on where water systems are located are biased and uninformed, it is likely that resources will be distributed unfairly. In these cases there will be a wide variation in the levels of service between the communities, or a big gap between the 'haves' and the 'have nots'. The Equity in Distribution Indicator (EDI) measures the gap between those that have services and those that don't.

The water point survey – the basis for the indicator

Initially a survey was carried out to establish the age, provider, location and condition of every improved community water point in the rural areas of Salima. The survey itself was carried out by eight staff working for the District Assembly. Visiting every improved water point in Salima they used a simple questionnaire and a hand held Global Positioning System (GPS) unit which was capable of accurately marking the position of a water point. The quality of the data they produced was verified by the Supervising Monitoring Officer in Salima, who visited a randomly chosen sample of 10% of all the surveyed sites. Additional verification visits were carried out by WaterAid. The survey results were entered on a database and used to develop maps using Global Information System (GIS) technology.

Brief summary of the findings of the survey

The findings from the research are summarised in Box 5 and show that:

- 50% of the total number of water points in Salima were built between 1998 to 2002
- 78% of the 1112 of the improved community water points were operational. This level is above the nationally quoted figure that states only 60% of the water points in Malawi are operational at any one time
- Over 17 organisations or donors have worked in Salima since 1998. With this many organisations, achieving good coordination is difficult
- 74% (819) of the water points where mechanically drilled wells fitted with an Afridev handpump. However, 62% of the population live in areas with a high water table where simple hand augering or shallow well technologies would be acceptable

Method for calculating the EDI

The main unit used for calculating the EDI is the improved community water point (ICWP) density. For this, the number and location of water points must be known along with the population distribution of the area. In the Salima research, population information was obtained from the 1998 National Statistics Office census, and the water point location from the GIS/GPS database.

Three units of population were used for the research in Malawi:

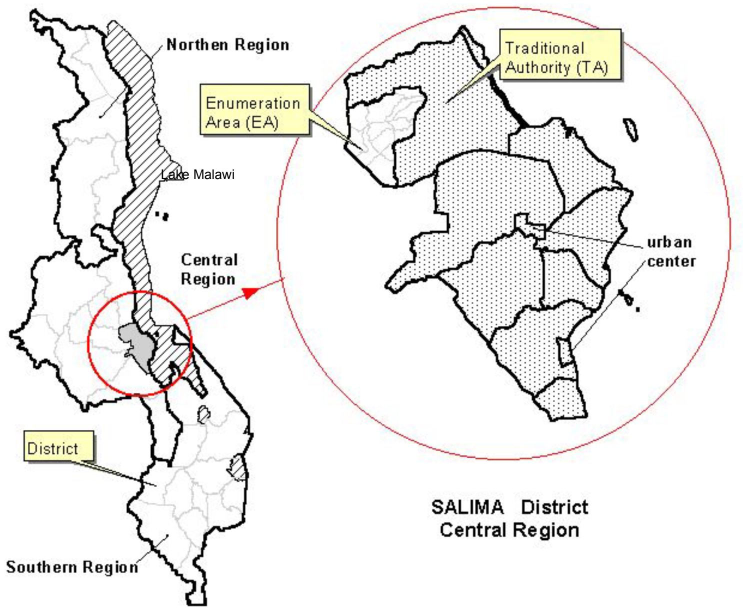
- Census areas, termed enumeration areas, which ranged from a population of 500 to 2000 people (there are 192 rural enumeration areas within Salima district)
- The traditional authority area comprising of an average of 19 enumeration areas with populations ranging from between 10,000 to 25,000 people.
- The District Area of Salima comprising of ten traditional authority areas and a total population of around 220,000 people

A water point density, is expressed in water points per 1000 people. For example if a census enumeration area has a population of 1250 people and has three improved community water points (ICWP), this gives an ICWP density of 2.4 improved community water points per 1000 people (calculation = 3/1250 x 1000 = 2.4)

From this, the deviation between ICWP densities within a given area can be calculated, for example by traditional authority or district. To calculate the deviation it is first necessary to calculate the mean density of the enumeration areas being studied. This is achieved by:

1. Calculating the ICWP density for each of the enumeration areas in the given area (as above). Then adding these together and dividing by the number of enumeration areas to provide the mean density.

BOX 4. The Salima district of Malawi



The table on page 6 shows a worked example demonstrating how the mean ICWP density in a traditional authority containing ten enumeration areas is derived. In the example table above the average has been calculated at 2.96 which represent a mean of 2.96 ICWP per 1000 population.

To obtain the deviation within the area the following is then calculated:

2. Subtract each of the individual enumeration area densities from the average enumeration area density. This calculates how far a particular enumeration area deviates from the mean of the area under study.

3. Make this figure positive.

4. Calculate the sum of the differences from the mean. Then finally divide this by the number of enumeration areas being studied. The resulting figure is the Equity in Distribution for a given area.

In the continuation of the worked example the 'Equity in Distribution' within this traditional authority is 1.47.

The higher the EDI figure the smaller the degree of equity in the allocation of improved water

BOX 5: Brief findings of the water point survey

	Date of installation			Total	%
Water point type	Pre 1998	1998-2000	2001-2002		
Mechanically drilled borehole	365	236	218	819	74
Hand drilled borehole	39	34	25	98	9
Shallow well	14	2	29	45	4
Windlass well		7		7	1
Gravity fed stand-pipe	75	1	12	88	8

Enumeration areas	A	B	C	D	E	F	G	H	I	J	Total	Average for traditional authority area
Population	1520	2000	700	1675	1360	1560	1980	1320	1495	1450		
Number of ICWP	2	9	1	4	5	7	0	8	3	5		
ICWP density at traditional authority area level (per 1000)	1.60	4.50	1.43	2.39	3.68	4.49	0.00	6.06	2.01	3.45	29.61	2.96
Difference from sub district average (eg 2.96 - 1.6 = -1.36)	-1.36	1.54	-1.53	-0.57	0.72	1.53	-2.96	3.10	-0.95	0.49		
Make into a positive figure and find the mean	1.36	1.54	1.53	0.57	0.72	1.53	2.96	3.10	0.95	0.49	14.75	1.47

facilities. Zero would be the ideal figure and represent the perfectly fair distribution of resources.

Findings of further analysis of the results

Comparison of water point densities between the enumeration areas within the traditional authorities

By using the 'date of installation' data recorded during the survey (see Box 5) it was possible to track how ICWP densities for each traditional authority changed from 1998 to 2002. The density recommended by the Ministry of Water Development (MOWD) is four water points per 1000 (or one for every 250 people). The graphs on page 7 illustrate the following results:

In the traditional authority of Pemba, with its eighteen enumeration areas, the deviation in ICWP densities is very marked and has increased from 1998 to 2002.

The number of enumeration areas with densities greater than recommended has increased, while the number with low densities has remained static. The level of equity has decreased from 1998 to 2002. The Inequity in Distribution indicator within Pemba is now 3.6.

A different pattern can be seen in the traditional authority area of Kulunda which has seven enumeration areas.

From 2000 to 2002 the un-served people have been specifically targeted and this has resulted in the poorly served areas obtaining new water points in preference to those already served. As a result the deviation in the equity between the enumeration areas has improved over the past five years and so the gap between people with and without services has decreased. The poor have benefited from this project and the EDI within Kuluunda is now 1.4.

Comparison of water point densities between enumeration areas within the district

When the ICPW densities are taken for all 192 enumeration areas within the district, the deviation in equity becomes even more apparent.

There appears to be a few enumeration areas within Salima that have continually received water points between 1998 and 2002 while others have not. This is despite the fact that in 1998 these areas were already over the MOWD recommend density of four water points per 1000 people and were therefore already relatively well served. This can be seen by the way the curves in the third graph sharply increase for the last enumeration areas. Around 35 of the enumeration areas in rural Salima (equivalent to 19% of the enumeration areas and 36,000 people) currently have a water point density of twice the MOWD recommended standard.

At the other end of the curve are the un-served. Despite significant investment in Salima they remain without water servcies. Around 105 of the enumeration areas (equivalent of 54% of the enumeration areas and 120,000 people) are still below the MOWD recommend density. Forty nine of these (equivalent to 27% of the enumeration areas and 51,000 people) have less than half the recommended density ie less than two water points per 1000.

Use and interpretation of the Equity in Distribution Indicator

The interpretation of the EDI is relatively simple; the higher the figure, the lower the degree of equity in the allocation of improved water facilities.

In the case of Salima the deviation in water point densities across the 192 enumeration areas is 2.9. It is only possible to judge whether this is good or poor for a district in Malawi by comparing it with other districts. The WaterAid programme in Salima will use this as a method of showing whether the poorest communities have been successfully targeted. If a programme is successful, the figure should fall.

For a national indicator, a study involving randomly chosen enumeration areas from different regions and different districts is likely to provide a deviation figure which is representative of the whole country. There would be no need for a complete country survey.

At another level, the indicator could be regarded as a reflection on the quality of the management and control in the water sector. If the equity of distribution figure is low, it indicates that the capacity of the body undertaking the co-ordination process is high and that any money invested is likely to be allocated in a fair manner.

Investing more money in such a situation is likely to be well targeted. Conversely, if the equity of distribution figure is high it indicates that the capacity of the body undertaking the co-ordination process is low and any investment is unlikely to reach the unserved. In such a situation, investing more money is unlikely to influence the goal of halving the proportion of people without access to safe drinking water by 2015.

A spin-off of the process is the ease in which the funding gap, ie the difference between money needed and the money provided, can be calculated. Government ministries and organisations lobbying for greater investment in the sector may find this aspect particularly useful.

Financial implications of a low level of equality

By using these example figures and the accurate location of all the water points it is possible to assess how much money has been invested in Salima in providing new water supplies from 1998 and 2002 and how much was well targeted.

To do this the following assumptions were made:

- An enumeration area is considered well served when it has a ICWP density of at least four per 1000 as recommended by MOWD
- The derived unit cost of a water point is reasonably accurate
- All the water points are functioning
- There are no deafults ie if the contract was to drill 50 boreholes then 50 boreholes have or will be provided

To calculate what this means in financial terms it is necessary to attribute costs to the different types of water point technologies. For the purpose of this paper the costs and ratios in the table below were used.

Summary of financial calculations

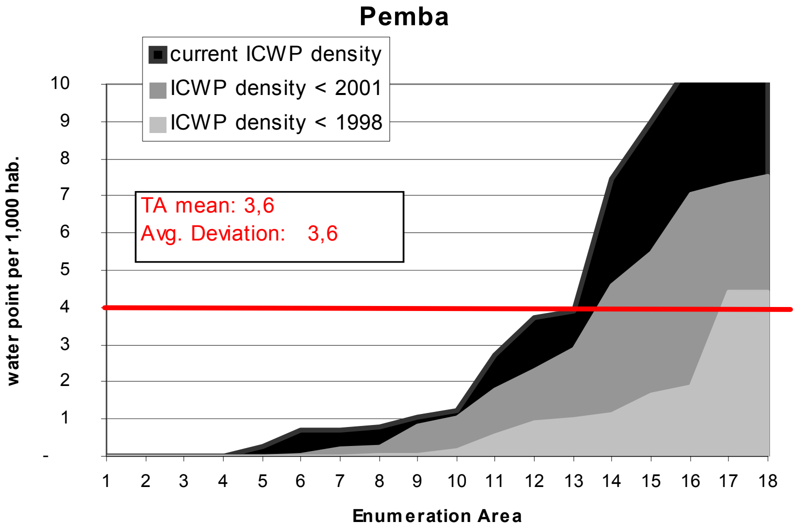
The survey found that in Salima:

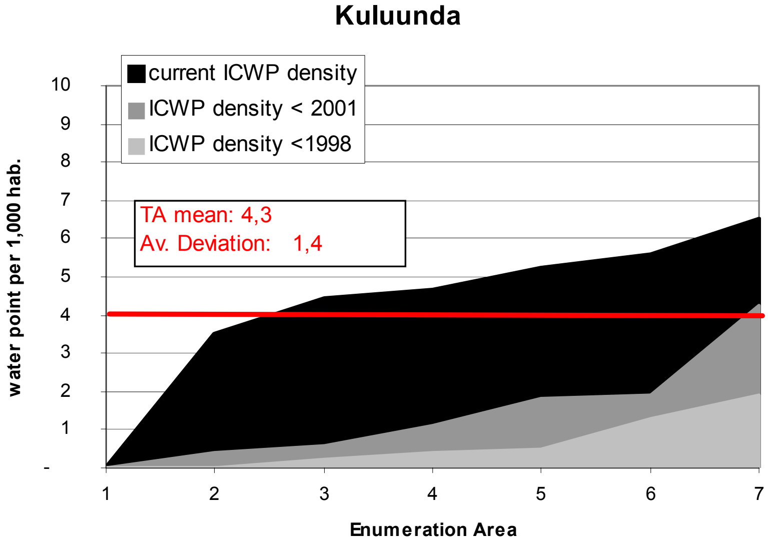
- 489 well targeted water points were needed in 1998 to ensure an overall density of four per 1000
- 537 improved water points have been provided in rural Salima since 1998
- 274 (51%) of these improved water points were targeted incorrectly at communities which already had a density of four or more per thousand
- 226 well targeted water points were still needed at the time of the survey to meet the recommended standard

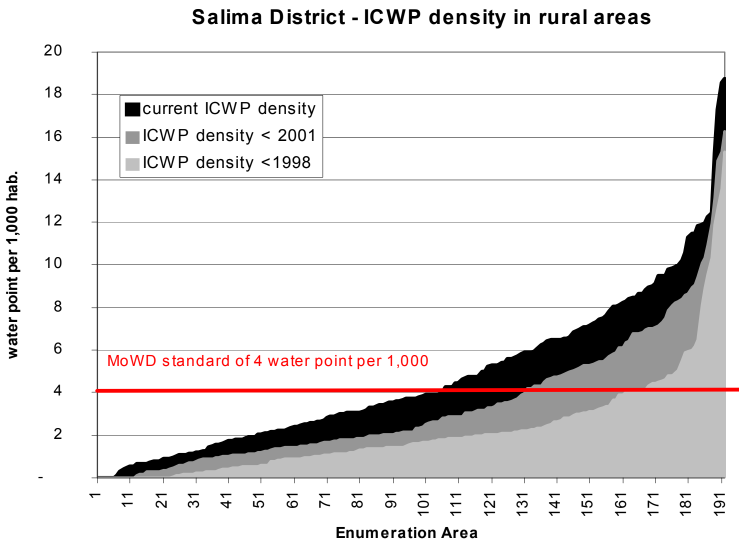
The number of water points provided since 1998 is actually greater than the actual number required for all the enumeration areas in the district to meet the recommended MOWD standard.

By applying the technology ratios and costs to these figures the financial implications of all the work carried out in Salima are:

The ICWP densities in Pemba, Kuluunda and the Salima District







In the graphs above the enumeration areas have been placed in order of increasing water point density, with the lowest densities to the left and the highest to the right

Costs and ratios of technologies used			
Technology	Cost in US$	Actual number installed	As a %
Mechanically drilled borehole	4200	446	83
Vonder drilled borehole	1800	54	10
Shallow well with handpump	650	32	6
Shallow well with windlass	400	5	1

- US$2 million has been spent on installing new water points since 1998
- US$1.02 million has been spent in a poorly targeted way
- US$0.9 million is still needed to bring the currently poorly served enumeration areas up to recommended density if the same ratio of technology is used. However, the amount needed can be halved to US$450,000 if the most appropriate technology for the hydrogeology is always used.

If the current rate of investment continues ie US$2 million every four years (or US$500,000 per year) then US$16 million or 32 years of investment will be needed. This means that in 2034 Salima will have achieved full coverage using the current system of targeting and technology selection (assuming 100% sustainability).

However WaterAid's research has shown that if water services are targeted correctly so that all areas are supplied equally then there is a potential saving of US$15.76 million and 27 years. WaterAid therefore believes that there must be a strategic coordinated approach to resource allocation and developing the capacity of the Ministry of Water Developments planning processes to effectively manage their sector.

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Conclusions

The sustainability snapshot indicator

Although designed as an evaluation tool, WaterAid believe that the sustainability snapshot could be developed to form the basis of a national indicator for sustainability. Work will be needed to develop the process at country level and ensure consistency in use. It is envisaged the indicator would be most effective if the respondents were all part of an existing multi-stakeholder network. The snapshot profile developed for a country may need backing up with some relatively quick and simple field work.

The Equity in Distribution Indicator

This indicator, for the first time, enables the water sector to be quantifiably assessed on its effectiveness at targeting the unserved. This is important as the evidence from Malawi suggests that the way resources have been distributed in the past has been unfair. The unserved have been repeatedly ignored and the relatively well served continually given additional water facilities.

In financial terms, around 50% of an estimated US$2 million spent in one district in Malawi on installing new water points since 1998 has been poorly targeted. $2 million was more than enough to ensure that all the population was served up the standard recommended by the Ministry of Water Development. As it is, a further US$840,000 is needed to serve the current unserved if the method of allocating resources is changed so it purely targets the unserved. This could be halved to around US$450,000 if the most appropriate technology for the hydrogeology is also always used.

WaterAid—water for life

WaterAid is an international NGO dedicated exclusively to the provision of safe domestic water, sanitation and hygiene education to the world's poorest people. These most basic services are essential to life; without them vulnerable communities are trapped in the stranglehold of disease and poverty.

WaterAid works by helping local organisations set up low cost, sustainable projects using appropriate technology that can be managed by the community itself.

WaterAid also seeks to influence the policies of other key organisations, such as governments, to secure and protect the right of poor people to safe, affordable water and sanitation services.

WaterAid is independent and relies heavily on voluntary support.

For more information about WaterAid please contact:

WaterAid
Prince Consort House
27-29 Albert Embankment
London
SE1 7UB
UK

Telephone: + 44 (0)20 7793 4500
Facsimile: + 44(0)20 7793 4545
Email: wateraid@wateraid.org.uk
www.wateraid.org.uk

UK charity registration number 288701