
A STUDY OF THE FACTORS AFFECTING SUSTAINABILITY OF RURAL WATER SUPPLIES IN TANZANIA

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Summary: This study was commissioned by WaterAid to explore the reasons behind non-functionality of distribution points in central Tanzania. The research was initiated after a water point survey revealed average functionality rates among public distribution points of just 45%. Similarly low rates of functionality haunt development practitioners the world over, despite the use of technologies and social strategies purported to increase sustainability.

Keywords: Water Management, Communities, Water Supply, technologies, hydrogeology

ABSTRACT:

This study was commissioned by WaterAid to explore the reasons behind non-functionality of distribution points in central Tanzania. The research was initiated after a water point survey revealed average functionality rates among public distribution points of just 45%. Similarly low rates of functionality haunt development practitioners the world over, despite the use of technologies and social strategies purported to increase sustainability.

To explore the causes of non-functionality of distribution points, a purposive survey was undertaken covering 38 villages in six different districts in Dodoma and Singida regions. It captured both quantitative and qualitative data. A range of aspects were examined: technological, management, demand and socio-economic status across a range of hydrogeological and policy environments. Results showed poor financial management was the primary correlate of non-functionality. Therefore the main elements of financial management are explored in detail in the rest of the report.

The key findings are as follows. Revenue collection was weak in the majority of villages, improved by the introduction of a private operator. The report emphasises the need for pricing based on achieving full cost-recovery; an aim found not to be entirely unrealistic. Simplicity in management structures is recommended. Flat-rate contributions and a punitive bond are highlighted as important elements of the private operator's contract. There is currently an absence of regulation at the village level, a role that could usefully be performed by district WAMMA teams. The ongoing use of alternative sources is found to undermine cost recovery, but also highlights the priority given by users to water softness. Orthodoxy surrounding concepts of ownership and participation are challenged, inviting a re-examination of the responsibilities of implementing agencies and donors in achieving sustainability.

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LIST OF SYMBOLS

DP	Distribution Point
DWE	District Water Engineer
NGO	Non-governmental Organisation
PO	Private Operator
SAMME	Singida Afya Maji Maendeleo Elimu (Singida Health, Water, Development and Education)
Sh	Tanzanian Shilling
VWC	Village Water Committee
WAMMA	Wawezeshaji Maji Maendeleo Afya (Facilitation for Water, Development and Health)
WUA	Water User Association
WUG	Water User Group

Currency conversions: \$1 = Sh1,273
£1 = Sh2,540

Buckets have capacity of 23 litres unless otherwise stated

1. Introduction

1.1 Justification for the research

This study explores the reasons behind non-functionality of water points in six districts within Dodoma and Singida regions of central Tanzania. The work has been commissioned by WaterAid, a UK-based charity that aims to improve the welfare of people living in poverty by delivering water supplies, improved sanitation and hygiene education through their local partners. They have been working in Tanzania since 1983, and now have activities in Dodoma, Singida, Tabora and Manyara regions, as well as Dar es Salaam.

WaterAid have contracted a Dar es Salaam-based company, Geodata Ltd., to survey water points which has so far covered all communal water points in Dodoma, Singida and Tabora regions, as well as Kiteto district in Manyara region. Analysis of the resultant dataset indicates that just 45% of distribution points¹ (DPs) are functional in these areas. WaterAid-funded DPs in comparison have a functionality rate of 67% across these same areas. This mapping exercise clearly exposed the problem of sustainability of water points.

In March 2006 WaterAid commissioned an external consultant to undertake a Status Review of the water supply in Dodoma region, which highlighted the need for research into the non-functionality of DPs so that they could be brought back into service. The aim of this study is to explore the main reasons for non-functionality of DPs in order that action can be taken to ensure the longevity of service provision at the village level.

¹ A distribution point is defined as the point at which water can be drawn from an extraction system. This is the extraction system itself in the case of a point source such as a handpump, but is a standpipe in the case of a piped system. It is therefore possible to have a non-functional (ie dry) standpipe as part of an otherwise functional system.

Improving the sustainability of rural water supplies has a number of consequences. It ensures the ongoing provision of a service that is fundamental to improving health, reducing the burden of carrying water long distances, and enabling users to live a life of dignity. Sustainability today invariably depends upon communities taking financial responsibility for their schemes, which if achieved will enable scarce resources from government and donors to be targeted specifically on areas where there is no improved water supply. The chances of achieving the Millennium Development Goals to half the proportion of people without access to safe water by 2015 will be seriously lowered unless levels of sustainability can be greatly improved.

1.2 Tanzania in profile

Tanzania ranks 164 out of 177 countries in the UNDP's Human Development Index (2005). 36% of the mainland population is below the basic needs poverty line (Household Budget Survey, 2000). The country is divided into 26 administrative regions, which are subdivided into 127 districts. The fieldwork for this study was conducted in Dodoma and Singida regions, both in central Tanzania. Dodoma has five districts; Dodoma Urban, Dodoma Rural, Mpwapwa, Kongwa, and Kondoa. Singida has four; Iramba, Manyoni, Singida Urban and Singida Rural.



Figure 1: A map of Tanzania

Dodoma is a semi-arid region in the central plateau. Altitude is almost constant at 1,000 – 1,100m. The average rainfall is 570mm per year, the majority of which falls between December and April. In Dodoma there is little perennial surface water, and groundwater depths of up to 200m. This explains the prevalence of pump and engine schemes, with Mono pumps and Lister engines the most common technology. In Kondoa and Mpwapwa district however, the more mountainous topography lends itself to gravity schemes.

Singida borders Dodoma to the west and receives approximately 660mm of rainfall per year. In many areas there are shallow aquifers allowing for the widespread use of shallow and medium depth handpumps such as Nira and Afridev

respectively. The dispersed nature of the settlements also makes point source extraction systems more appropriate. 55% of the population of Singida is below the basic needs poverty line, the highest of any region (Household Budget Survey, 2000).

In both areas the population is relatively poor, relying on traditional farming and livestock keeping, the success of which is threatened by unpredictable rainfall patterns and low investment capacity. There are however pockets of exception: in Kondo and Kongwa agriculture is mechanised and conducted on a larger scale, and socio-economic status is noticeably higher.

1.3 Tanzania's rural water supply policy

In National Water Policy (2002) stipulates that communities are responsible for full cost recovery, which means the recovery of the complete cost of the installation of the system, as well as covering costs for operation and maintenance. Therefore sustainability is not just reaching the design life of a technology, but about the ongoing availability of clean, affordable and accessible water.

Approximately 80% of Tanzania's population live in rural areas (National Water Policy 2002). Only 50% of people living in these areas have access to an improved water supply, as defined by the UNICEF and WHO Joint Monitoring Programme (2000). The National Water Policy (2002) identifies seven pre-requisites for sustainable rural water supply:

1. Management at the village level
2. Communities owning and managing their schemes
3. Communities achieving full cost recovery for operation and maintenance of the scheme, as well as replacements
4. Availability of spare parts and expertise

5. The protection of water sources
6. Compatibility of technology and service level with the capacity of the beneficiaries
7. The recognitions of women as key players

The Village Water Committee (VWC) was the product of the 1991 National Water Policy, which shifted responsibility for rural water supplies from the government to the village. In recognition of the poor performance of the VWC the latest National Water Policy offers six options for management; Water User Associations (WUA), Water User Groups (WUG), Board of Trustees, Company, Cooperative Society and Corporation. These can each be registered at the Ministry of Water (except the WUG, that must register at the district) to become autonomous legal entities. These management entities are not founded on experience and therefore their viability has not yet been tested. Despite the introduction of the National Water Policy four years ago, the new management entities have not been widely established and the VWC remains the default management option.

The six management options:

Water User Association: A committee usually constituted of members of each WUG in the village, responsible for managing the village water supply. Registered with the Ministry of Water and Livestock Department under the Water Utilization Act, amendment no.8, 1997

Water User Group: The group of users of any one DP, represented by an elected committee, members of which often form the WUA. Registered with the local District Councils, Local Government Act. No. 8, 1992

Board of Trustees: An independent, elected and unpaid board of villagers that directs a delegated management structure. Registered with the Ministry of Justice and Constitutional Affairs, Trustee Act Cap.375

Company: A company limited by guarantee registered with the Ministry of Finance, Companies Act no. 212, Section 3(1), operating for profit

Cooperative Societies: Member-owned and -controlled society registered with the Ministry of Cooperatives and Marketing, Cooperative Societies Act No. 14, 1982

Corporations: As with company, but can also operate like an NGO. Registered with the Ministry of Home Affairs, Corporation Act No.25, 1974

Box 1: The six management options from the Water Policy 2002

Legal registration of the water user entity results in ownership of the water scheme being vested in the community. Without registration, communities have ownership over the management of the scheme, but it is the district that owns the hardware. In order to cultivate a greater sense of ownership, communities are obliged by the National Policy to make a 5% cash contribution to initial capital costs.

The targets for the minimum service level are a year-round supply of 25 litres of potable water per capita per day, from water points at no greater distance than 400m from the dwelling and which serve no more than 250 people. In sparsely populated areas, achieving both of these latter targets requires a huge investment of resources, and significantly increases the per capita cost of the service.

Each of Tanzania's districts has a District Water Engineer (DWE) who is responsible for the provision of improved water supplies in the area. WaterAid's partners are district-level multi-disciplinary teams operating under the DWE, comprised of staff from the departments of Water, Community Development, Education and Health, known as WAMMA (WAwezeshaji Maji Maendeleo Afya, meaning Facilitation for Water, Development and Health) in Dodoma and SAMME (Singida Afya Maji Maendeleo Elimu, meaning Singida Health, Water, Development and Education) in Singida.

Literature review

In the context of this report, sustainability is best defined pragmatically as ‘whether or not something continues to work over time’ (Abrams, 1998). More specifically for this research, it implies the ability to recover from technical breakdown in the scheme. Built into common conceptions of the term are notions of minimal external support, village-level financing and the continuation of a beneficial service over time (Parry-Jones et al, 2001). It is estimated that 35% of all rural water supplies in sub-Saharan Africa are not functioning (Baumann, 2005), and despite the frequency with which it appears in development discourse, the reality of sustainability remains elusive.

Sustainability pertains to multiple aspects of a rural water supply, with institutional, social, technical, environmental and financial dimensions (WELL, 1998). This accounts for the fact that understanding and measuring sustainability is so difficult, and why solutions are highly context specific. Conceptual frameworks, such as the one below, have been developed to capture the interlinkages that relate to sustainability, a weakness in anyone of which can lead to failure of the scheme.

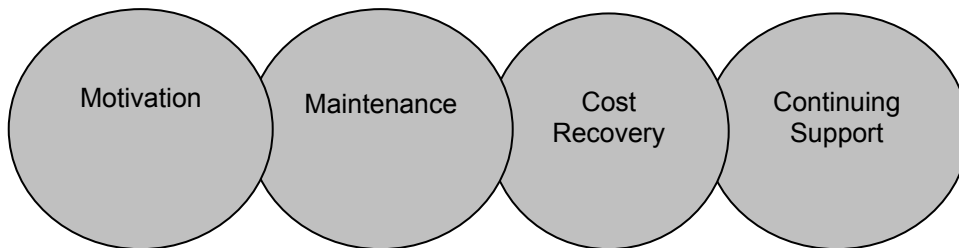


Figure 2 : The Sustainability Chain, Carter et al 1999

The widespread failures in water supplies have been attributed to a number of flaws in the project; the intervention was not desired by the community, the capital and/or recurrent costs are too high for the community, lack of ownership results in neglect of maintenance and repairs, the promised benefits don't materialise, education programmes are too short and trained members of the community move away or lose interest (Carter et al, 1999). Other factors such as the on-going use of traditional sources of water, poor systems of cost recovery and the distaste for the water from the improved source also contribute to undermining sustainability (Parry-Jones et al, 2001).

Practical responses to the challenge of sustainability are being tested and used by development practitioners the world over. Due to the widespread trend in developing countries of the devolution of responsibility for water schemes from governments to villagers, many of the interventions aimed at improving sustainability are taking place at the village level.

The use of appropriate technologies which are low cost, easy to maintain, simple to use and readily available is one response to the challenge of sustainability. Appropriate technologies are integral to the concept of Village Level Operation and Maintenance (VLOM) which emerged in the Water Decade (1981 – 1990). Many of its basic principles are still guiding the water sector today, though a tension persists between the ease of maintaining a system and its durability (Reynolds, 1992). The VLOM conceptualisation of the community as an island also neglects to recognise the role of external support agencies, such as the government, in achieving sustainability (Webster et al, 1999).

It is common practice for village water schemes to be managed by a village committee of some sort; the creation of which is intended to enable communities to have a major role in the project, to have a sense of ownership over the scheme and to ensure its ongoing operation and maintenance (Harvey & Reed, 2006). It has

been suggested that ‘beneficiary participation is the single most important factor contributing to project effectiveness’ (Narayan, 1994). Without participation, it has been claimed that systems are unlikely to be sustainable even if spare parts and repair technicians are available. Participation can take different forms, including the initial expression of the demand for water, the selection of technology and its siting, the provision of labour and local materials, a cash contribution to the project costs, the selection of the management type and even the water tariff (Harvey & Reed, 2006). It is thus the process through which demand-responsiveness is exercised, and empowerment achieved.

Participation is viewed as a tool for improving the efficiency of a project, assuming that where people are involved they are more likely to accept the new project and partake in its ongoing operation. It is also seen as a fundamental right; that beneficiaries should have a say about interventions that affect their lives (Pretty, 1995). Kumar (2002) asserts that participation is a key instrument in creating self-reliant and empowered communities, stimulating village-level mechanisms for collective action and decision-making. It is also believed to be instrumental in addressing marginalisation and inequity, through elucidating the desires, priorities and perspectives of different groups within a project area. Participatory methods now dominate in the implementation of development interventions at the village level, the most common method being Participatory Rural Appraisal.

Participation is also aimed at increasing the sense of ownership over the water supply within community members. A history of top-down service delivery by governments and NGOs frequently leaves a legacy of dependency in the villages on external assistance. Consequently, in the event of a failure in the water supply the villagers do not make any attempt at repairs as it is not perceived to be their responsibility.

This research aims to look at the current status of sustainability in central Tanzania, to explore whether and which of the aforementioned dimensions of sustainability are effective, where and how success has been achieved and what needs to be done to improve rates of functionality of water schemes. In light of the findings, development practice is given a closer critique.

2. Method

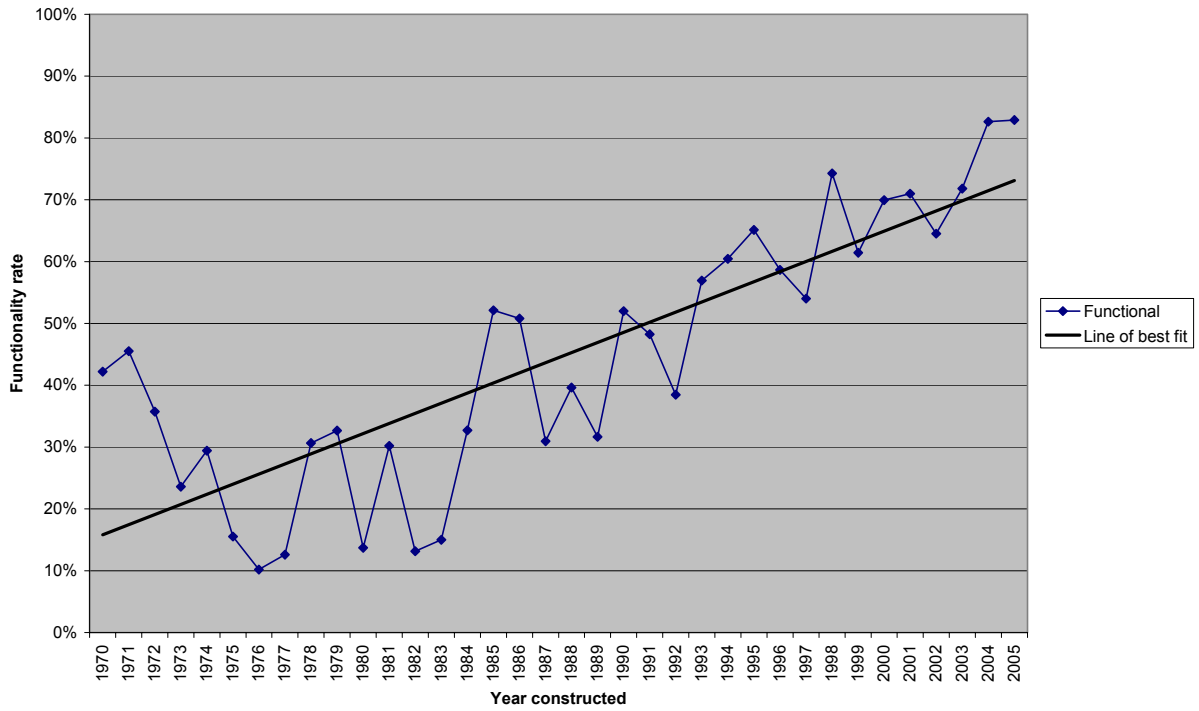
3.1 Sampling and methodology

The purpose of this research was to explore the causes of non-functionality of rural water schemes in Tanzania. This broad, exploratory research agenda did not provide an obvious entry point to the fieldwork. The limited time available for the study precluded the use of a randomised sampling approach as it would be difficult to visit a sufficient number of villages to make results statistically valid.

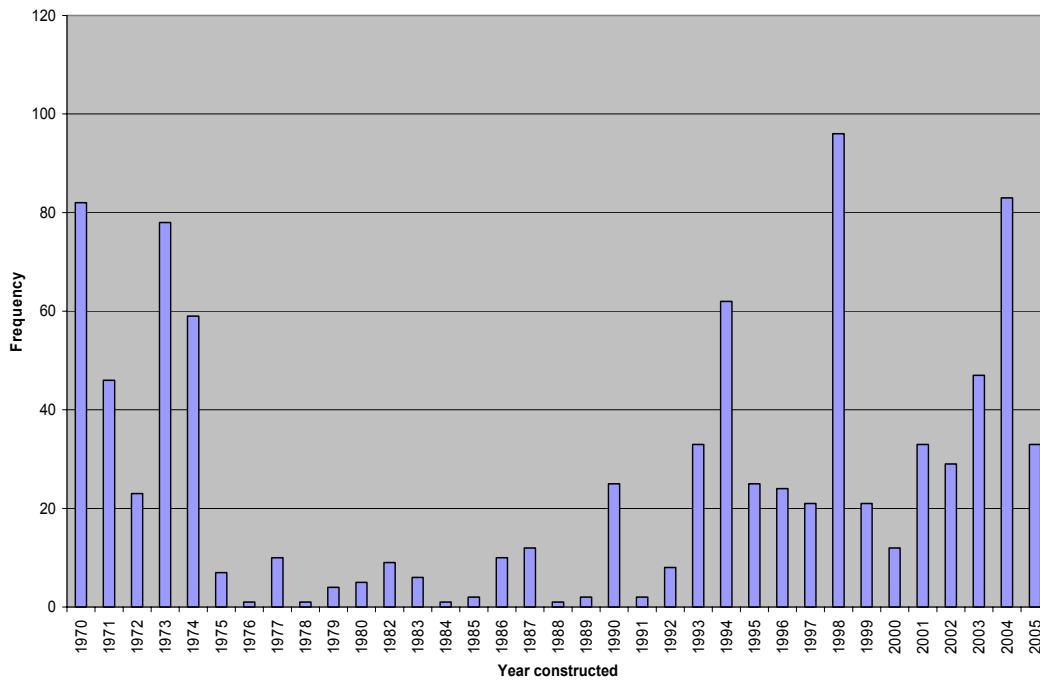
Furthermore, this approach could have led to the exclusion of villages known to display features of particular interest. Therefore a purposive sampling strategy followed by a qualitative research methodology was adopted.

In order to refine the research hypothesis the Geodata 5 dataset of 6959 entries, each with 37 variables, was analysed for trends in functionality using Excel pivot tables and charts. Variables included region, district, extraction system, management type, installer, funder, installation year, water quality and quantity and status. This revealed that functionality most highly correlated with the age of the scheme; the newer the scheme, the more likely it was to be functional.

An anomaly in the trend in graph 1 can be seen in the early 70s when functionality rates increase relative to the 1976 low. This is most likely accounted for by the large number of gravity schemes installed between 1970 and 1974 which are not subject to the same profile of the loss of function over time as are other extraction systems.



Graph 1: The functionality rate of extraction systems against installation year



Graph 2: The number of gravity schemes installed per year

The relationship displayed in Graph 1 between the age of the scheme and functionality gave rise to the revised research hypothesis:

It is assumed that older schemes are more likely to have experienced breakdown than new schemes. Villagers do not recover their village water schemes from breakdown, and so failures in the village water scheme result in its abandonment.

The fieldwork was then carried out to find out if this hypothesis is correct, and if so why villagers are not recovering their schemes from breakdown, in order that targeted steps can be taken to increase sustainability.

Information on breakdowns was not available and therefore for the purposes of sampling it was assumed that all old schemes had experienced breakdown, and so functioning and non-functioning old schemes were selected to examine how the breakdowns had been managed. It was suspected that villages hosting functioning old schemes may display some sort of coping mechanism that has ensured the ongoing performance of their water supply. New schemes were also included in the sampling firstly to validate the assumption that new schemes have not experienced breakdown and secondly to examine the differences in implementation strategy over time.

‘New’ and ‘old’ categories were differentiated by the age at which it would be expected that a technology type would begin to experience failure. According to WaterAid engineers, problems with handpumps usually begin in their fifth year of operation, while for pump and engine schemes problems usually begin in the seventh year. The timing of breakdowns obviously varies with respect to hours of usage but this definition was apparently sufficiently reliable to justify its usage as

the basis of category formation from which samples were taken. In the absence of any moving parts the functionality of gravity schemes is not correlated with time. However, because of their significance as an extraction system, some gravity schemes were also included in the sampling for comparison.

Dodoma and Singida region were chosen as areas for study as WaterAid has supported numerous projects in these regions, and the span across different districts allowed for a comparison of different levels of government involvement, settlement characteristics, hydrogeology and socio-economic status. As well as differences in the age of the scheme, samples included schemes displaying different management types, funders and installers. A range of different technologies were included, though a bias was given to the technology that was most prevalent in a given district; handpumps in Singida and pump and engine schemes in Dodoma. The samples were chosen through consultation with district WAMMA representatives, the DWE and WaterAid staff.

Functioning / Old	Functioning / New
<p>Handpumps: Wibia, Singida Rural Musambu, Singida Rural Lumuma Mafene, Mpwapwa</p> <p>Pump and Engine: Chitemo, Mpwapwa Mzase, Mpwapwa Matongoro, Kongwa Ngomai, Kongwa Mvumi Makulu, Dodoma Rural Mvumi Mission, Dodoma Rural</p>	<p>Handpumps: Makotea, Singida Rural Ikungi, Singida Rural Ikenga, Singida Urban Kisaki – A, Singida Urban Mwembemoja, Singida Urban</p> <p>Pump and Engine: Sejeli, Kongwa Kibaigwa, Kongwa Fufu, Dodoma Rural Manzase, Dodoma Rural Mtipa, Singida Urban</p>
Non-Functioning / Old	Non-Functioning / New
<p>Handpumps: Senene Mfuru, Singida Rural Chungu, Singida Rural</p>	<p>Handpumps: Manga, Singida Urban Mitau, Singida Urban</p>

Matyuku, Singida Rural <i>Pump and Engine:</i> Kibakwe, Mpwapwa Leganga, Kongwa Miganga, Dodoma Rural	<i>Pump and Engine:</i> Inzomvu, Mpwapwa Zoissa, Kongwa
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Table 1: Villages included in samples

The chosen method of inquiry was the semi-structured interview. The use of a pre-determined conceptual framework to underpin investigative questioning was avoided for fear of closing out the possibility of finding something new. However, the chosen themes of inquiry were very similar to Carter et al's (1999) components of the sustainability chain (presented in the literature review) though other variables were also included. Three different interviews were held in each village: one on the technology, conducted with the pump attendant or person experienced with the technology; one on management, financial and installer issues held with a representative of the management entity and one on demand, held with a female villager. An asset assessment was also carried out through consultation with a village leader (see Appendix A).

Initially three questionnaires, one on each theme mentioned above, were used for information gathering, chosen in order that certain (mainly quantitative) pieces of information were captured and that all desired areas of investigation were covered (see Appendix B). The questionnaire was piloted, improved and then employed for the first week of fieldwork. However, over that period it was quite clear that the rigidity and order of the questionnaire was not suitable. It was more informative to be able to respond to what the interviewee was saying thereby capturing the individual characteristics of the scheme, a process that required flexibility and impromptu questioning that were not afforded by the questionnaire. Therefore the questionnaire was converted into a series of prompts (including those needed to get

the necessary quantitative information from every village) organized into themes of inquiry that was a marked improvement and worked well as an inquiry tool.

3.2 Analysis

Each semi-structured interview was written up into a narrative, the complete set of which can be found in Appendix C. Each narrative is followed by a comment and a calculation of the revenue generating potential of the system, used as the basis of rating the revenue collection. Key variables were extracted from the narratives and used to compile a spreadsheet which facilitated rapid comparison of features in different villages (Appendix D). However, the spreadsheet was used as an entry point to the narratives rather than an information source in its own right as the inputs can only be properly understood by taking into account its unique context. Villages were grouped according to the original research hypothesis of whether or not they have recovered from breakdown, and these two groups were analysed according to a variety of variables to identify what were the main correlates of sustainability.

3. Results

In order to explore the original hypothesis that villagers are unable to cope with breakdowns, the villages visited have been grouped so that similarities can be identified. The categories are as follows²:

- A. Schemes that have never broken down
- B. Schemes that have broken down and not been rehabilitated
- C. Schemes that have broken down and been rehabilitated

The main findings from the analysis of the spreadsheet are presented in this report.

4.1 Category A: Schemes that have never broken down

<i>Old</i>	
Matyuku,	Afridev (1990s)
Musambu,	Nira (1992)
Ughandi – B,	Nira (1991)
Lumuma Mafene,	2 SWN (1996)
Kibakwe,	Gravity (1971)
Kandaga,	Gravity (1993)
Kibakwe	Nira (1989)
<i>New</i>	
Senenemfuru	Nira (2004)
Lumuma Mafene	3 Nira (2002)
Mwembemoja	Nira (2004)
Makotea	Mono & Lister (2003)
Wibia	Afridev and Nira (2001, 2005)
Chiseyu	Electrical submersible (2004)
Mvumi Mission	Electrical submersible (2003)

² Leganga has been omitted from the analysis because the scheme in question was installed and subsequently removed by the government before responsibility for management was transferred to the community and therefore no village-level features pertaining to sustainability, which are the focus of this study, are present.

Manzase	Mono and Lister (2001)
Ngomai	Electrical submersible and Chinese generator (2005)
Zoissa	Mono & Lister (2001)

Table 2: Category A villages with extraction system

The ability of these villages to recover their scheme from breakdown has never been put to the test. It is noteworthy that of the old schemes that have not experienced breakdown, they are all either gravity or (usually shallow) handpumps. This is due to their simplicity and ease of work load, in comparison to the deeper and more complex pump and engine schemes. The on-going functionality of these schemes whilst apparently beneficial does have its disadvantages. Village-level technical skills learnt at installation can be forgotten if they are not practised, and therefore when a breakdown does occur the ability to cope with it is likely to be significantly lower.

4.2 Category B: Villages in which schemes have broken down and not been rehabilitated

<i>Village</i>	<i>Extraction type</i>	<i>Breakdown type</i>
Matyuku	3 Afridevs (2 1989, 1 1990s)	Rod, rising main, rising main thread
Musambu	5 Niras (1992)	2 rod thread, 3 dry
Senenemfuru	Afridev (1992)	Foot valve
Ughandi-B	2 Afridevs (1991)	2 Cylinder/footvalve
Kwayondu	Gravity (1993)	Pipes
Kibakwe	Pump and engine (1952)	Borehole needs cleaning
Wibia	3 Niras and 3 Afridevs	1 Nira dry, rest footvalve, bushes and seals
Kibakwe	Nira (1989)	(unknown)
Manga	Afridev (2005)	Riser pipe
Mitau	Afridev (2003)	Cylinder
Inzomvu	Mono and Lister (2002)	Pump

Table 3: Category B villages with extraction system and breakdown type

The only common feature among this group is that none of the villages listed have a bank account (only the sub-village in Senenemfuru has a bank account, but this is for a separate handpump that is managed by a separate body and is still functioning). 'Bank account' specifically refers to an account that is used for saving money from water revenue or collections that are raised as a consequence of the use of an extraction system rather than collections raised pre-installation for the initial capital contribution, and therefore Inzomvu is not classed as having an account. Wibia reportedly has Sh80,000 in savings but this is not in an account, and has been held by two sub-village leaders for up to a year, and therefore its existence is questionable. In Mitau, the secretary is apparently holding the Sh3,000 for that sub-village but again it is doubtful whether those funds still exist. In Manga, the Village Executive Officer and the sub-village chairperson were unaware of a bank account, though the villager interviewed said that there were savings which was not verified.

Within this category, there are WUAs and WUGs, POs and VWCs. This suggests that the management system per se does not guarantee the successful performance of the water scheme. The PO requires a strong contract and supportive asset holder, and WUAs, WUGs and VWCs all require very strong leadership and organisation.

In Kibakwe, as a result of poor management of the water scheme, the village government have resigned and with them the VWC. Of the other 7 VWCs, only two, Invomvu and Kandaga, have met within their agreed schedule. Three (Matyuku, Musambu and Senenemfuru) have become totally inactive. Neither of the two WUGs have met within their agreed time frame. The commitment of the management is evidently low.

In just Mitau and Ughandi-B community members reported being unwilling to pay, though this can often be caused by perceived mismanagement. Access to spare

parts was not once reported as a problem in any of the villages in this category. This can be attributed to the fact that in the areas studied, expertise was often provided by the district technicians or Pump and Engine Maintenance Service (PEMS), and spare parts were supplied at the district centre either through SEMA in the case of handpumps in Singida, or for districts in Dodoma through the relevant DWE office. It is the financial management that stands out as the principal cause of persistent non-functionality in this category.

4.3 Category C: Schemes that have broken down and were rehabilitated

<i>Village</i>	<i>Extraction Type</i>	<i>Amount in account</i>
Chitemo	Mono and Lister (1992)	Sh5,447,393
Chungu	3 Nira (various)	Sh250,000
Fufu	Mono and Lister (2002)	Sh533,000
Ikenga	Afridev (2003)	Sh0
Ikungi	Electrical submersible (2004)	Sh4,648,482
Kibaigwa	Mono and Electric Motor (2002)	Sh2,700,000
Kisaki – A	Afridev (2003)	Sh58,200
Lumuma Mafene	1 Nira (2002) or SWN (1996)	Sh0
Matongoro	Mono (1996) and Chinese engine (2005)	Sh860,000
Miganga	Mono (1998) and Chinese engine (2006)	Sh879,500
Mima	Climax and Lister (1996)	Sh514,155
Mrijo Chini and Olboloti	Electrical submersible (2004)	Sh1,500,000
Mtipa/Manguanjuki	Mono and Chinese engine (2005)	Sh50,000
Mvumi Makulu	Mono and Electric motor (1983)	Sh1,500,000
Mzase	Mono and Lister (1986)	Sh1,200,000
Ngomai	Mono and Lister (1994)	Sh2,500,000
Sejeli	Mono and Lister (2001)	Sh1,500,000
Wisuzaje	Mono and Lister (2004)	Sh0

Table 4: Category C villages with extraction type and back account size

In contrast to category B, only 3 villages in this category do not have bank accounts for their revenue from water at the time of visit. Ikenga did have a bank account at the point of the last breakdown, but used all the savings for the repairs, and have not collected any revenue since, primarily due to the drought. The other village without a bank account is Lumuma Mafene, but the schemes there have only experienced very small problems with their village handpumps which have been paid for by the village government. Also the sub-village of Wisuzaje does not have a bank account. Sh540,000 collected from water sales was lost by the previous VWC in a bus accident, after which all funds were going to the PO who paid for the overhaul of the engine in August 2005. The operation of the scheme ceased in March 2006 with the onset of the rains, and the VWC Chairperson said that a bank account would be opened with the first month's contribution from the PO once operation is resumed.

So it is the ability to pay for repairs that has enabled villages in this category to recover from breakdown in the water scheme.

4. Discussion

The clearest result from the study is that it is poor financial management that is undermining sustainability in the area studied. This topic will therefore be the focus of discussion for the rest of this report, attention to the finer details of which may serve to provide useful information on ways to improve financial management in villages which should have a significant positive impact on sustainability.

5.1 Revenue collection

Four main categories of revenue collection have been identified and ranked in order of effectiveness³:

- 1: No revenue collection at all
- 2: Money collected when there is a breakdown
- 3: Revenue collection taking place, but either money is not collected from all users or money is disappearing post-collection
- 4: Revenue collection good

Category B Village	Revenue Collection	Category C Village	Revenue Collection
Inzomvu	3	Chitemo	3
Kwayondu	1	Chungu	3
Kibakwe	3	Fufu	3
Manga	3	Ikenga	3
Matyuku	1	Ikungi	4
Mitau	3	Kibaigwa	4
Musambu	1	Kisaki – A	3
Senenemfuru	3	Lumuma Mafene	1

³ Effectiveness here may be defined as the sum of money that is deposited in the water fund relative to that which ought to be deposited

Ughandi-B	1	Matongoro	4
Wibia	3	Miganga	4
		Mima	3
		Mrijo Chini and Olboloti	4
		Mtipa/Manguanjuki	3
		Mvumi Makulu	3
		Mzase	4
		Ngomai	-
		Sejeli	3
		Wisuzaje	-

Table 5: Scores for revenue collection

From Table 3 it is possible to see that villages in Category C generally score higher on revenue collection than those in Category B. However, even within the villages in Category C where repairs had been paid for, the revenue collection was far from perfect. In one village, Lumuma Mafene, revenue collection was not taking place at all at the time of breakdown, but costs were covered instead by the village government. Whether this is a sustainable arrangement is highly questionable; village government funds may neither be available nor sufficient to cover a more expensive breakdown or replacement. Six villages had ‘good’ revenue collection, though this accreditation should be accepted with caution. ‘Good’ revenue collection does not necessarily mean good value for money for the villagers who are paying. Four of the six are managed by POs, and where contracts are not based on the actual turn-over of the scheme, profits can be very high and therefore the water fund loses out. Any type of poor financial management will increase the vulnerability of the scheme to falling out of operation.

There are several possible reasons for poor revenue collection. The method of revenue collection makes a difference, with payment per bucket superior to a monthly payment as it is much simpler to manage and more difficult for users to dodge. Revenue from the water scheme is a reliable and unique stream of money in the village and under management by VWC the money is often used for other

purposes by the village government. There are also social pressures acting on the revenue collector to exclude friends and family from the obligation to pay (Maranz, 2001). According to WAMMA staff, in areas where there is the belief that water is a gift from god, those seen to be collecting money for its use can face social exclusion.

It is also possible that there is a lack of incentive to perform the job of revenue collection well. In Chitemo village, revenue collectors are paid Sh2,000 per week, which is less than £1 for what is almost a full-time post. In contrast, in Ngomai, a highly successful VWC-managed scheme, the revenue collector is paid Sh7,000 per week and the treasurer approximately Sh5,800 per week, which perhaps brings with it a desire to do well, envy from other villagers and therefore competition, and a sense of duty. The PO has a large incentive to perform well, and this may be one of the principal reasons for their success.

Relatively high wages may contribute to the success of the scheme; it may also be one of its consequences. But it would seem logical that turning water management into a job could engender the right incentives and pressures to turn it from a largely voluntary pastime, the success of which relies upon individual good will, into the source of gainful full time employment.

An indicator of future performance in revenue collection is the successful (or otherwise) completion of the initial capital contribution that is stipulated by the installer. When communities fail to fulfil this obligation it is often indicative of levels of organisation and leadership in the village, and should be taken as a warning of an inability to raise funds that may be indicative of future performance in cost recovery. Inzomvu, Lumuma Mafene, Mitau and Zoissa all host non-functioning schemes and did not pay their initial capital contribution. Only Ikenga has failed to contribute and hosts a system that is still functional.

5.2 Pricing

Pricing can be used to reconcile differing imperatives; equity in access, demand management and cost recovery. Demand management may be required when there is a difference in the quality of water from different sources; borehole water maybe salty and therefore less desirable than soft handpump water. It is important that community members are not priced out of the opportunity to access water from an improved source. In Mpwapwa there are some villages in which water is sold at a price of Sh50/bucket, which equates to \$1.96/m³ (where \$1 = Sh1,273). This may make buying water prohibitive for some members of the community. Tiered pricing could help ensure everyone can access water from the village supply.

Flexibility in pricing can also serve to encourage use of clean and safe water during the rainy period, when free alternative sources are often used. For example in Manzase, Dodoma Rural, water is provided for free during the rainy season, a period for which the VWC operates the system and the running costs are covered directly from the water fund. The system is then managed by a PO during the six months of the dry season; the period in which the system generates its money.

Cost recovery is fundamental to ensuring financial sustainability. The term can refer to different costs:

1. Covering operation and maintenance costs, and replacement of the extraction system. For Afridev and Nira, these are outlined in the table.
2. Full cost recovery, which will generate the equivalent of the total cost of the original installation, including surveying, drilling, transport and

the technology, as well as funds for operation and maintenance (consistent with the National Water Policy 2002).

This study shows that even within a technology type, the breakdown profile varies significantly. For example, the Afridev in Manga broke down within a year due to a broken riser pipe section, while the Afridev in Matyuku has not experienced any breakdown at all since the 90s. Neither of the handpumps were locked over night to restrict access. This poses a challenge for price determination, because if an average breakdown profile is used, some villages will be left without sufficient funds in the case of early breakdown, and others will potentially accumulate large funds that would be rarely used. This variation could be settled by the pooling of water funds within a ward or division. The use of water funds in rural savings and credit schemes (SACCOS) has been trialled. However, the use of water funds in investments in non-water activities threatens to drain that valuable reserve. It would be preferable if expenditure of pooled savings was restricted to just water-related activities. Better loan facilities from established financial institutions would also help here, which would prevent one village scheme undermining another through misuse of pooled funds, and would also benefit from management by professionals. Access to loans enabled Ngomai to install a complete new system, and other villages could in theory benefit from access to such a service.

The cost of the Nira and Afridev handpumps are outlined below:

	Nira	Afridev
Maintenance: First Year	Sh 12,000	Sh 15,500
Maintenance: Second Year	Sh 20,000	Sh 35,800
Maintenance: Third Year	Sh 25,000	Sh 50,000
Maintenance: Forth Year	Sh 29,000	Sh 76,000
Maintenance: Fifth Year	Sh 45,000	Sh 100,000
Maintenance: Sixth Year	Sh 45,000	Sh 100,000
Maintenance: Seventh Year	Sh 45,000	Sh 100,000

Maintenance: Eighth Year	Sh 45,000	Sh 100,000
Maintenance: Ninth Year	Sh 45,000	Sh 100,000
Maintenance: Tenth Year	Sh 45,000	Sh 100,000
<i>Total</i>	<i>Sh356,000</i>	<i>Sh777,300</i>
Cost of purchasing, transport and installation of cylinder, pump head, rising main and concrete seal	Sh1,800,000	Sh1,800,000
<i>Total 10 yearly costs</i>	<i>Sh2,156,000</i>	<i>Sh2,577,300</i>
Cost of new HP installation (pump, surveying and drilling 50m borehole)	Sh11,685,000	Sh11,850,000
<i>Total costs over 30 years</i>	<i>Sh16,353,000</i>	<i>Sh17,781,900</i>

Table 6: Predicted maintenance costs per year for the Nira and Afridev handpumps.

Source: Activity Report for Pump Attendant Training, WaterAid, and personal correspondence

According to industrial specification, Niras and Afridevs work for approximately 10 years. According to WAMMA engineers, the life span of a borehole is approximately 30 years. This information, coupled with the figures above, can be used to calculate the required household monthly contributions for different levels of cost recovery, displayed in Table 5.

No of Households	25	50	100	150	200
Cost of maintenance over 10 years					
Nira	Sh718	<i>Sh359</i>	Sh180	Sh120	Sh90
Afridev	Sh859	<i>Sh430</i>	Sh214	Sh143	Sh107
Cost of new handpump installation and maintenance over 30 years					
Nira	Sh1817	<i>Sh908</i>	Sh454	Sh303	Sh227
Afridev	Sh1976	<i>Sh987</i>	Sh494	Sh329	Sh247

Table 7: Monthly contribution per household to cover different costs

The Tanzanian National Water Policy gives a target of 250 people per point source which equates to approximately 50 households. This suggests that for Nira and Afridev handpumps, the monthly contribution required to cover the cost of maintenance over 10 years and then a replacement of the cylinder, rising main and pump head is approximately Sh400. At present, monthly contributions are usually Sh200.

Full cost recovery would involve an increase in the contribution to approximately Sh1000 per month. While considerably more than that which is currently being paid, this equates to approximately Sh30/day, which is just over the normal price for a bucket of water. And that would be for a household that is likely to use approximately 5 or 6 buckets per day. Therefore, with the same amount of usage, this would equate to approximately Sh5/bucket, which is highly achievable.

Technology	Capital Cost
Lister (diesel-fuelled engine, manufactured in either the UK or South Africa)	Sh7-8 million
Mono (progressing cavity pump)	Sh15 million
Electrical Submersible (pump with electrically-powered motor next to pump below water level)	Sh8 million
Chinese DF (diesel-fuelled engine, manufactured in China)	Sh500,000 – 1 million
Chinese HZ (diesel-fuelled electricity generator manufactured in China)	Sh500,000
Borehole (depends on depth and soil type)	Sh8-15 million

Table 8: Cost of different technology types.

Source: WAMMA

The calculations performed here are very rough, but at least provide indicative figures for the achievement of full cost recovery which may be possible in some

places. The implication here is that price standardisation is not suitable as is done in Dodoma Rural as it is entirely dependent on technology, population size and consumption. Where low yields and small population sizes prohibit full cost recovery, either different types of technology should be considered such as the use of Chinese engines instead of Listers. Or more small-scale improvements that are in line with communities' desires (rather than donor's) and capabilities should be given consideration (Sutton, 2004) that allow for incremental, community-driven improvements in the water supply.

Another obstacle to financial sustainability and cost recovery is the availability of cash in villages. In some villages such as Ikenga and Kisaki-A villagers reported being unable to pay per bucket because cash was unavailable on such as regular basis. Cash is usually more available around harvest time, though it should be noted that local brew is bought in all the villages in which a cash problem was reported, so the issue may be more one of priority of the use of cash. This poses a challenge to policy on revenue collection, and must be accommodated for if necessary. In Miganga more people pay for their water with millet or maize than cash. The Village Government determine the amount of grain required to pay for a bucket of water, and the grain is then sold by the VWC and the money put into the water fund. This is one way in which the unavailability of cash can be overcome.

“Some people would be able to pay Sh20 per bucket, but those who can't would revert back to alternative sources” Villager in Kisaki - A

Box 2: Villager's comment on payment in Kisaki - A

It is interesting to note that the average population size of the villages (discounting sub-villages from the calculation) in Category C is 6110 people, ranging from 3095 people in Chungu to 16,000 people in Kibaigwa and Mvumi Makulu. In contrast, in the Category B, the average size of the population in the villages was 2991

people, ranging from 1559 people in Matyuku to 6500 people in Kibakwe. These differences in population size may be indicative of differences in socio-economic status, business activity and experience, access to resources and infrastructure, all of which could affect the success of a water scheme in virtue of the levels of leadership, organisational skill and experience in the village, as well as attitudes within the village related to independence from outside support and paying for services. It is also a factor that determines the potential turn-over of a water scheme, as there is a greater demand for water (assuming no access to alternative sources and a sufficient yield) and therefore the village has a greater capacity to finance its water scheme.

5.3 Management

Community management entities should be as simple as possible. All the villages in Singida Urban whose schemes were funded by WaterAid have established WUA and WUG. The relationship between these two entities, and their respective roles and responsibilities, were often ill defined. In pump and engine schemes such as that shared between Mtipa and Manguanjuki, it was reported that the WUG, who was managing the DP, had no role to play once they have assigned a revenue collector to the DP.

Similarly, with handpump schemes the relationship between the WUA and WUG is not clear, and the need for the existence of both of them is not obvious. Either the WUA should manage all the handpumps within a village or each handpump should have its own management entity like the WUG, with no umbrella management. The advantages to having management at the level of the technology are that there may be a better sense of ownership over the scheme and the finances may be more easily managed. But management that encompasses all schemes in the village enables greater sums of money to be generated, as well as the

possibility of cross-subsidisation of those schemes that have a very small user group, or are situated in a poorer area. It can also cope with early breakdowns as the required funding will be generated faster. In Dodoma, all schemes are managed by one central entity, but this is facilitated by the fact that the villages are nuclear. In Singida a disaggregated management structure may be more appropriate due to the fact that the settlements are more dispersed.

Where water supply systems cover more than one village, it is counter-productive to have both village-level bank accounts as well as the joint management bank account. Where there is more than one bank account, competition is created. This was the case in Makotea, where the three participating villages each had their own bank account, and only the village that hosted the system was prepared to put money into the joint account. In this situation it may be better to position management with those who have greater ownership over the scheme, in this case the village that hosted the extraction system. The other two villages could participate as users, and either pay per bucket to revenue collectors employed by the WUA in Makotea, or even buy the water in bulk for the village, and manage it themselves from there.

Alternatively, it may be preferable to have equal representation of all participating villages in the management entity in order to make different interests known, as seen in Matongoro, Kongwa. It is possible that the unequal levels of commitment from the three villages involved in the Makotea scheme was a product, rather than the cause, of the management set-up. In Matongoro, there is just one Joint VWC for the three villages and one PO, and the scheme is operating successfully, and it was reported that all three participating villages were equally committed to the scheme. If management of multiple-village schemes is successful, then the chances of financial sustainability are higher as the numbers of users is significantly greater.

The very notion of community management is invariably a product of the idealisation of communities in developing countries. Largely unfounded assumptions of social homogeneity and harmony go part way to explaining its widespread failure.

5.4 The Private Operator

In this report ‘private operator’ refers to an individual or small group that holds a contract or agreement with the management entity to operate, and sometimes maintain, the village water scheme. In Kiswahili, such private operators are referred to as either ‘wakala’ or ‘mbia’.

Enthusiasm for water projects often wanes after 2-3 yrs (Carter et al, 1999) and therefore ideally a system of operation should be instituted that is self-perpetuating, rewarding those that are involved to ensure continuation of the service. Successful development has been described as ‘the art of finding the greatest confluence of self-interest’ (Abrams, 1998). Perhaps this best explains the success of the PO relative to the VWC. As an incentive-based system, it is in the interest of the PO to effectively collect revenue to maximise profits, and in doing so in theory guarantee the health of the village water fund.

<i>District</i>	<i>Total Villages</i>	<i>No of POs</i>	<i>First PO Introduced</i>
Singida Urban	19	0	-
Singida Rural	146	0	-
Mpwapwa	84	6	1998/1999
Kongwa	67	6	2002
Dodoma Rural	128	50	2002
Kondoa	177	2	1991

Table 9: The number of POs per district visited and their date of introduction

The 2002 National Water Policy has emphasised the need for greater private sector involvement in rural water supplies. Increasing the number of POs requires a full commitment not just from WAMMA teams but from the DWE, district councillors, and even regional stakeholders. This is only seen in Dodoma Rural, a commitment which is reflected in the number of POs in the district all of which have been introduced in a relatively short period of time as shown in table 7. In 2002 Dodoma Rural passed a by-law that asserts that every village in Dodoma Rural must have an PO, and an official letter has been sent to every village in the district to state this.

There is an attitude among implementers that POs cannot work handpumps because they are not sufficiently profitable. This is not necessarily the case, as proved in Kibakwe where POs had been installed on each of the two handpumps, giving Sh30,000/month to the village government. The viability will be increased if the PO covers all the handpumps in a village.

The introduction of the PO system goes some way to distancing the village government from revenue collection and the water fund as money no longer passes through their hands. Cash is deposited directly into the bank account on a monthly basis by the PO. Where the PO has to give the monthly contribution to the village government there is the danger that the money never reaches the bank, as has happened in Kibakwe. Furthermore, withdrawals from the water fund require the signature from the DWE as an additional safeguard against inappropriate expenditure of water revenue.

However, even the PO is not immune from interference from village government, as demonstrated in Mvumi Makulu where the government subverted the operation of the PO in order to regain access to the water revenue. (Since visiting Mvumi Makulu, members of the village have gone to the DWE to invite the WAMMA team back to the village in order to facilitate the process of improving their

management.) Registration of the management entity is an essential step towards financial sustainability by securing its autonomy. It also goes further towards achieving the separation of roles; the regulator (village government) is separate from the asset holder (WUA or Board), who are distinct from both the service provider (the PO) and the purchaser. It has been proposed that the separation of these roles enhances the performance of a water scheme (Nkongo, forthcoming).

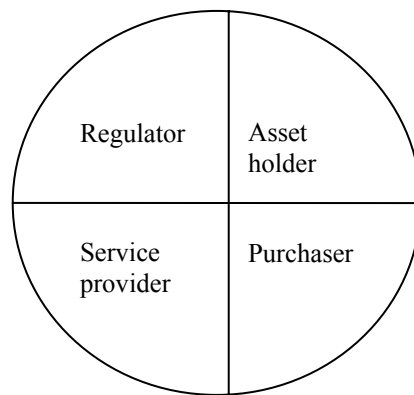


Figure 3: The separation of roles

An example of the benefits of legal recognition can be found in Kibaigwa. Here the village government actually seized management of the village water supply, a period during which funds seriously declined. The board were however able to seek legal help, thanks to which they were reinstated. Prior to the take over, a system had been set up whereby water was sold for Sh20/bucket, Sh5 of which was given to the village government for development activities. While it is essential for this revenue stream to also be well managed, the arrangement potentially serves as a compromise between autonomy of the water scheme and the needs of the village government. If fund raising for village government can piggyback on the water revenue collection system, it provides an effective and efficient means of generating money for other activities that serve the community.

5.4.1 The contract

The contract is the cornerstone of a successful PO, and needs to be comprehensive and sophisticated. To expect communities to devise their first contract taking into account all necessary features without any prior experience of contractual arrangement or private sector engagement is a tall order. Only in Dodoma Rural is there a standardised contract devised by the district that is used in every village in which there is a PO. The different contracts for Dodoma Rural, Mpwapwa, Kongwa and Kondoa can be found in Appendix E. The contract has been designed by the district, and the DWE, through WAMMA representatives, is a signatory on every contract. The advantages of a standardised contract are that it is easy to facilitate and to follow-up on, as facilitators know exactly what to look for and what to expect. Feedback from villages can be assimilated into the contract if deemed advantageous, an improvement that all villages then benefit from, rather than all having to make the same mistakes themselves.

There are some key aspects to the contract that vary from place to place, some variants of which are superior to others:

5.4.1.1 The Bond

The bond is a mechanism used to prevent defaulting on the contract by either party involved. In Mpwapwa, the PO must pay a lump sum into the water fund on receiving the post. This sum is non-refundable except in the case of unfair dismissal by the VWC, in which case they must return the sum. There are two weaknesses to this arrangement: firstly, once the PO has made back his original cash contribution, if the position ever becomes unfavourable (for example if the profit margin is very small) there is nothing binding him to the contract. Second, if the VWC want to break the contract they don't actually lose anything, they just pay back the original contribution made by the PO himself.

A more punitive system is employed in Dodoma Rural, where the PO has to put in twice the agreed monthly contribution to the bank and this money is returned to the PO once his contract is successfully completed. The bond is pegged to the monthly contribution in both the rainy and the dry season, and therefore it increases in the latter. If the PO breaks the contract at any time he loses his bond, and if the VWC breaks the contract without good reason, the PO gets back double what he originally put in. Therefore there is a penalty for either side if they break the contract, and the position becomes more secure. In Kondoa and Kongwa there is no form of bond.

5.4.1.2 The Monthly Contribution

Most POs make a payment to the water fund on a monthly basis. The determination of the correct monthly contribution is a difficult process. In Dodoma Rural, a WAMMA member spends a week in the village to assess the income generating capacity of the scheme which is used as the basis for the division of funds. This only yields a rough estimate however, as usage will be dependent on the time of the season, and in a piped scheme with multiple DPs it is a challenge to assess the demand at each point. It is however better than an arbitrary determination which would appear to be the norm elsewhere.

In the area studied the monthly contribution was either a flat-rate or a percentage of the total revenue for the month. In Dodoma Rural, a flat-rate system is adopted, whereas in other areas both types are used. The advantage of the flat rate is that it is easy for regulators to verify adherence to the contract; all that is needed is the pay-in slip from the bank. The problem with the flat-rate system is that without knowledge of the exact amount of money that the system generates, it is possible for the PO to make large profits at the expense of the growth of the water fund. For example, in Matongoro, the PO pays Sh200,000/month into the village fund in the dry season, which represents just 2% of the total monthly revenue generated. While it is the PO who is responsible for maintenance of the system, this does

seem like a very small proportion actually going to the fund. Similarly, in Mrijo Chini, Sh1million is being deposited into the water fund every month of the year, while the PO is making a profit of approximately Sh1,987,500 each month, and does not have to pay for maintenance. Even though there is a considerable amount of money going into the water fund each month, the size of the profit would suggest that it could be more. A balance must be struck between the gains of the water fund and those of the PO, and there is not the capacity, or perhaps even the consciousness in the village to challenge and evaluate the situation. This is a very important role for the district government to play.

In some villages the monthly revenue is divided into percentages to cover profit, maintenance, operation and water fund contribution. This not only is impossible to regulate in the absence of a meter, but does not reflect the pattern of breakdowns which are not regular. It is the PO that pays for maintenance, and therefore if there is no maintenance the operator makes a larger profit, and if there is maintenance he has to pay out. Where contracts last for just a year, some operators may be either disadvantaged or advantaged unfairly by this feature. Instead money for maintenance should come from the water fund, so the profit of the PO can be better managed and they can also be protected from expensive maintenance costs.

Follow up of payment by the village government of VWC is essential to ensure that the PO is adhering to his contractual obligations. In Mvumi Mission, Dodoma Rural, weak follow-up gave the PO the opportunity to retain the water revenue instead of paying it into the bank as agreed, and he is now in debt to the tune of Sh500,000 to the village water fund. One way to ensure better follow-up is to insist that the PO gives a copy of the paying-in slip from the bank not only to the village treasurer but also the DWE, and make them available publicly in the village to promote village-level supervision and transparency.

5.5 Regulation

One feature that is common to almost all village water schemes is the lack of regulation of those responsible for financial management. Users of the schemes, who are the asset holders and direct beneficiaries of the village water fund, do not seem to hold the management to account. This problem is compounded by the absence of external regulators, who could undertake audits as well as training and awareness-raising.

While the introduction of the PO does seem to be welcomed (if not explicitly requested) by community members and results in the swelling of the water fund, their presence is not without threat in the absence of strong regulatory forces. With the size of the rewards to be won gradually recognised, profiteering is highly possible and can already be seen. This will go unnoticed so long as the amount of water consumed is not known by the users, village government and district officials. Meters must be installed so that the revenue generated by the system is transparent to all stakeholders.

The introduction of the PO, or indeed any other management system, by no means divests the government of their responsibilities. Village-level supervision is essential in ensuring both the health of the water fund and the viability of the PO, as well as assuring value for money for all users. District-level back-stopping, auditing and problem-solving is integral to success.

The ability, and perhaps inclination, of villagers to perform voluntary regulation seems at present to be worryingly low. The primary concern of the villagers interviewed was whether or not water flowed; if the village system yielded water then users were satisfied, and seemingly disinterested in the matters of water management. In Kibakwe, no money was deposited in the bank account by the VWC for 10 years, and this went unnoticed.

“I think that the revenue collection is good: there is always someone there, I pay, and I get water... It is better to have the village government operating the system because [they] are effective. The PO was not good at raising funds for maintenance. I don't know about the village government and PO method of operating”. Villager in Mvumi Makulu, where approximately Sh1.5million had gone missing in the last 5 months after the village government had taken over from the PO. It was not the responsibility of the PO to pay for maintenance.

Box 3: Villager's perception of management in Mvumi Makulu

In Mvumi Mission and in Manzase, the interviewee did not know who was managing the system at all. In Fufu, Dodoma Rural, income and expenditure associated with the water scheme had been announced at the general meeting which was held two days before the interview was conducted. However, a villager interviewed who had been to the meeting could not remember anything about the announcement, or its implications. No evaluation of finances was observed in any of the villages visited. The only form of regulation enacted by the villages is the exemption of vulnerable groups from payment, which is of course very important.

This regulatory gap must be filled, and the WAMMA teams or other district-level officials are best placed to undertake this role. The only village in which there was routine auditing was Kibaigwa where they have an internal auditor and also an external audit on an annual basis. Could it be possible to stimulate voluntary regulation in villages? Its successful establishment would dramatically improve the running of water schemes and reduce the burden on under-resourced district teams. In other sectors, such as healthcare and primary education, services have been ranked according to objective criteria to introduce competition and enable people to compare their services to others. The difficulty with this is that different technology types, demographics and hydrogeological conditions determine the price and quantity of water available which makes comparison with other schemes

less useful and potentially harmful when nothing can be done to change the situation. Instead, if some sort of checklist could be used by villagers to analyse certain features of their own scheme then an insight into its performance could be gleaned. This area requires further exploration.

5.7 Alternative Sources

Interviews with female users of water supplies who are primarily responsible for the collection of water suggest that users prioritise convenience in access to water over other possible concerns such as health. Systems will be used, and valued, if they are closer and superior to the free alternative, representing a saving in the time and effort spent collecting water every day.

“The water from the borehole is a bit salty, and sometimes, even with the DPs working, I buy soft water for Sh200/bucket from a vendor in the nearest town for cooking beans and washing special clothes. I buy approximately two buckets per week”. Villager in Sejeli. The nearest town is 2km away from her village.

Box 4: Villager's attitude towards salty water

The value of soft water for villagers cannot be underestimated, and acts as a limiting factor for the use of, and therefore the money-generating capacity of, a water supply system yielding salty water. When planning for the installation of a new scheme, this preference must be taken into account.

The use of alternative sources is affected by price. In those communities where they pay a flat monthly rate, alternative sources are not used because they are invariably further away and of inferior quality, and the pricing system imposes no constraints on consumption. A shift to paying per bucket is likely to increase the

consumption from alternative sources. However, villagers report that they chose which water source to use for what purpose, and often opt for water from an improved source for drinking even if there are alternatives available.

5.8 Participation and Ownership

Participation and ownership are terms that are widely used in development discourse, and the adoption of participatory methodology is evident among many NGOs and government staff in Singida and Dodoma regions. But it is important that participation and ownership do not become ends in themselves, but only be the prerequisite for simple, service-oriented and financially sustainable systems.

The relationship between ownership and the development of a sense of responsibility within the community is not immediately obvious. A more likely link would be between demand, or value of the system, and responsibility, at least with respect to willingness to pay for operation and maintenance. Focus should be given to conveying the reasons behind the need to pay for water, which can be successfully achieved whether ownership is strong or not (Harvey & Reed, 2004).

The introduction of a PO is often delayed so that ownership can be cultivated during the period of management by VWC or WUA. But what villagers want is water, and the management of the requisite delivery system is to a large extent inconsequential to the users. Efforts to engender ownership should not preclude the establishment of sound and sustainable management.

There is a danger that participation in its current orthodoxy is an inferior substitute for sound local government or ongoing support from the implementing agency. Participation has its role, but also its limits. Critical decisions such as price determination and management type are left to the villagers, consistent with the

prevailing ideology of bottom-up development. But this notion of community choice may be no more than an illusion, embraced due to the desire to realise a demand-responsive approach.

In Singida Urban, all 19 villages that have WaterAid-funded schemes have established WUAs and WUGs as their management entity. This, apparently, is a result of community choice, but the coincidence is surely too great. More likely it is the mirroring of the opinion of the facilitator. The communities lack information and experience of management and are therefore unable to challenge the facilitator or make a free, informed choice. Describing this process as participatory and demand-responsive absolves the implementing agency and donor of responsibility over what may in fact be their decision.

Failure in achieving sustainability may well stem from the 'project approach' in which implementing agencies install a water system and then leave post-completion. This poses a serious ideological challenge to implementing agencies. They must either accept that their work is inherently top-down and attempt to find an objective and independent way of deciding which management type will best serve the communities. This may be facilitated by the determination of certain principles or features of management that can be assimilated by an array of different management entities, such as the separation of roles. Or agencies should enable management to evolve along its own lines, through a process of experimentation and trial and error. Self-supply (Sutton, 2004) would be more consistent with this approach. The former option requires excellent judgement by the agency, while the latter requires a lot of resources that can accommodate error; time, support and finances. If the top-down approach is accepted, policy changes should be made to reflect the on-going responsibility of the implementing agency or donor, so that management receives the maintenance and servicing that it needs so much.

5. Conclusions and Recommendations

Sustainability in the areas studied is clearly being undermined by poor financial management, the constituent elements of which must be addressed by implementing agencies, donors and government alike. The drive behind attempts to meet the Millennium Development Goals is drawing attention towards increased coverage to meet targets which potentially and harmfully distracts from the need for maintenance of water schemes: maintenance of both the soft- and the hardware, which is so critical for ongoing service provision.

Improvements to financial management can be achieved through a commitment to software at the district level, led by the DWE who must accept management as key to the success of water schemes, and adjust district policy accordingly so that they can provide training, regulation and support to villagers. Real decentralisation will facilitate this, though Dodoma Rural proves that it is possible under current circumstances. Intense support coupled with sound policies enables communities to cross the threshold after which they are better able to cope alone. This initial investment in follow-up could pay off dividends in the long run, breaking the cycle of breakdown followed by external support. Implementing agencies and donors must also recognise their responsibilities and provide well-reasoned guidance as well as instituting on-going support.

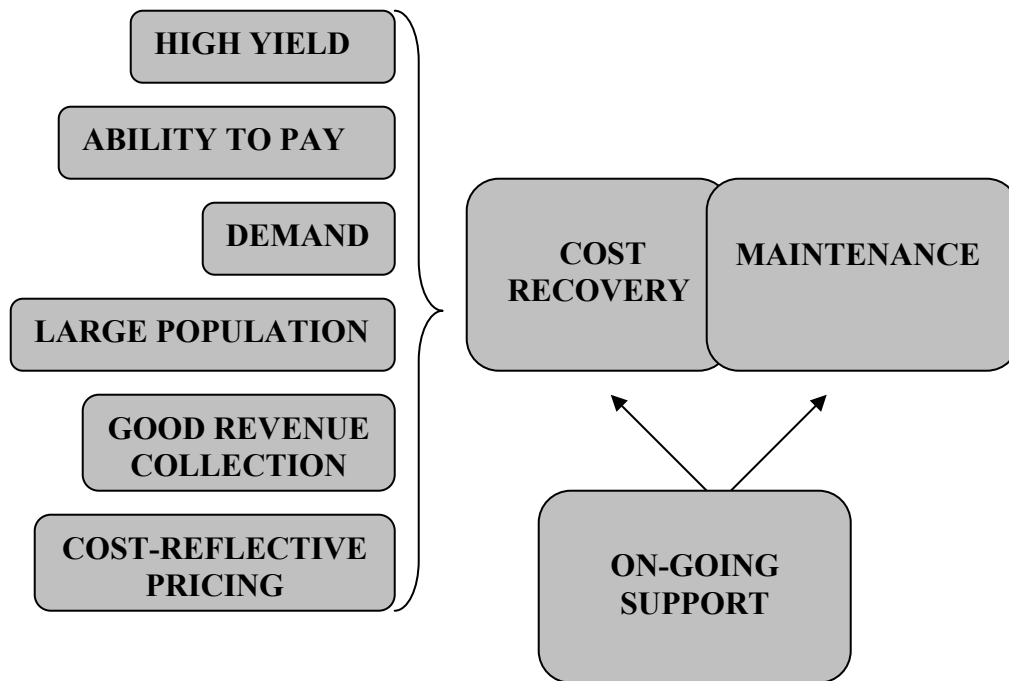


Figure 4: Requirements for maintenance

To assist in the pursuit of sustainability, certain recommendations will be made:

- There should be an aim to install meters on all schemes where this is viable to enable verification of revenue generation and contractual adherence and determination of flat-rate payments by the PO.
- Community members should have the opportunity to visit other schemes so that they can share problem solving strategies
- WAMMA/SAMME team members should also undertake exchange visits so that there is greater information sharing at the district level regarding issues such as the contract
- Information should be gathered that will enable the price of water to be determined in order to achieve full cost recovery. If full cost recovery is not realistic, amendments to the National Water Policy should be advocated
- Efforts should be made to introduce effective financial regulation of village water schemes. Managers and service providers must be made accountable

to the community members. Both the stimulation of voluntary regulation and external regulation should be explored. This could represent an important future role for WAMMA/SAMME teams.

- Increasing the number of POs is likely to have a positive impact on the size of village water funds, and is therefore recommended. However, regulation of the PO must be introduced to avoid profiteering and weak contractual arrangements.

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List of appendices (to be found on the accompanying CD)

Appendix A: Semi-structured Interview Prompt Sheet

Appendix B: Questionnaires

Appendix C: Narratives

Appendix D: Spreadsheet

Appendix E: Contracts