Field Note 13

Water and Sanitation Program

An international partnership to help the poor gain sustained access to improved water supply and sanitation services

Rural Piped Water Supplies in Ethiopia, Malawi and Kenya: Community Management and Sustainability

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Africa Region

Tap attendant, Tereta, Ethiopia.

Water, sanitation and hygiene are vital components of sustainable development and the alleviation of poverty. Across Africa, political leaders and sector specialists are generating new momentum in these important areas. This Field Note, together with the others in the same series, constitutes a timely contribution to that work. It is intended principally to help politicians, leaders and professionals in their activities. As the Water Ambassador for Africa, invited by the African Development Bank and endorsed by the African Water Task Force and the African Ministerial Conference on Water (AMCOW), I commend it to your attention.

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Water Ambassador for Africa

Blue Gold
Building African Solutions for Water, Sanitation and Hygiene

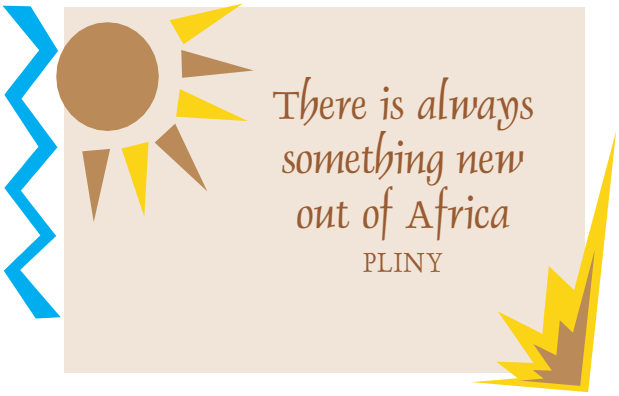
Summary

Large piped water supplies constitute a viable and cost-effective form of water supply in developing countries. The technical aspects of constructing them are well known, and the techniques for communities to manage them have become established and accepted.

This Field Note looks at large-scale community-managed piped water supplies in three countries (Ethiopia, Malawi, and Kenya) where such supplies have been successfully implemented for many years. It concentrates on the long-term sustainability of the service provided by such schemes; given its length, it does not claim to analyse the whole subject of community management.

The principles of community management are applied differently in the three countries. However, their experiences yield several clear conclusions regarding sustainability. First, social cohesion gives rise to the clarity of purpose and sense of ownership that ensure sustainability. Secondly, sound financial management, including the authority to set tariffs, the use of metering and sanctions against non-payers, is important for financial sustainability. Thirdly, the viability of community management systems improves if they have paid staff, good training for the community members and the management committees, and access to technical and professional support when needed.

These examples of large community-managed piped water supplies are not unique but could be replicated in other places in Africa with suitable water sources and social structures.



Background

Most drinking water supplies in Africa use point sources such as wells or boreholes. However, there are many places in which people live near hills containing perennial springs and streams. Here piped water supplies, usually flowing by gravity or in some cases pumped, may be more appropriate. Unlike a borehole or well, one piped supply can serve hundreds or thousands of households and achieve economies of scale. Community management of rural piped water supplies is now widely established in many countries and will become even more common in future. However, the number of consumers makes the process of community management more complicated, both during construction and operation, than for a small supply from a point source.

This Field Note describes community management of rural piped water supplies in Ethiopia, Malawi and Kenya. These countries all have extensive rural piped water programmes that have been operating for many years and are widely regarded as successful. The purpose of the Note is to examine the effect of community management on the sustainability of the water supplies. This sustainability depends both upon the quality of the infrastructure itself and upon its sound operation and maintenance, which in turn costs money – so cost recovery is given particular emphasis in this Note.

Water supplies in Oromia Region, Ethiopia

The people of Oromia Region in Ethiopia have great difficulty obtaining enough drinking water throughout the year, especially in the long dry season. During the 1980s, the Ethiopian Red Cross Society started to construct large gravity-flow piped water supplies in Oromia Region. It worked in partnership with the communities and with the government, the latter providing technical standards and supervision. Soon the government itself took the lead in implementing projects, and then in the 1990s WaterAid, the international NGO, began giving financial and professional help to the government schemes. Today Oromia Region contains several large community-managed water supply schemes, some of which have been in operation for over a decade.

Description and project implementation

The schemes use water from springs, piped under gravity into reservoir tanks and through extensive piped distribution networks to tapstands. They are designed to provide 20 litres of water per person per day to everybody within the service areas. The majority of people are served by public tapstands, at which they pay for water by the bucket; a few institutions and private households in small towns have metered connections.

The government engineers designed the schemes in accordance with technical standards and the wishes of the communities served. The people contributed approximately 20% of the capital cost in the form of cash and labour, with the balance coming from the government or external support agencies. During the construction of each scheme, a project steering committee was responsible for planning the overall project, supervising construction, monitoring activities against plans, and resolving problems. That committee comprised community members, central and local government staff, and WaterAid staff. Several management committees were formed, which continue to manage the operation.

Institutional arrangements and training for operation and maintenance

The details of the management structure vary among the schemes, but in all cases community-elected bodies own and manage the infrastructure.

Typically, each village served by a scheme elects a Water and Sanitation Committee, two of whose members are appointed to a Water Management Board for the whole scheme. The Water Management Board in turn elects an executive committee, which directs a paid staff typically comprising an administrator, an accountant, tapstand attendants, and technicians who carry out routine operation and maintenance.

A written constitution sets out rules for governance. These include rules for entry to and exit from positions of leadership in the various committees. Members of these committees do not receive any payment, although they are given allowances when travelling on official duties.

The committees and boards are formally linked to the local government water and health departments for support. For example, the water department seconds staff to carry out repairs and quality control activities that are beyond the technical capacity of the Water Management Board. This is, in effect, a small government subsidy for operation and maintenance.

The government and the external support agency provide extensive training to the various committees, the Board and the staff. This covers overall management, finance and personnel, by-laws, administration and record keeping, plumbing, sanitation and hygiene, as appropriate to the group being trained.

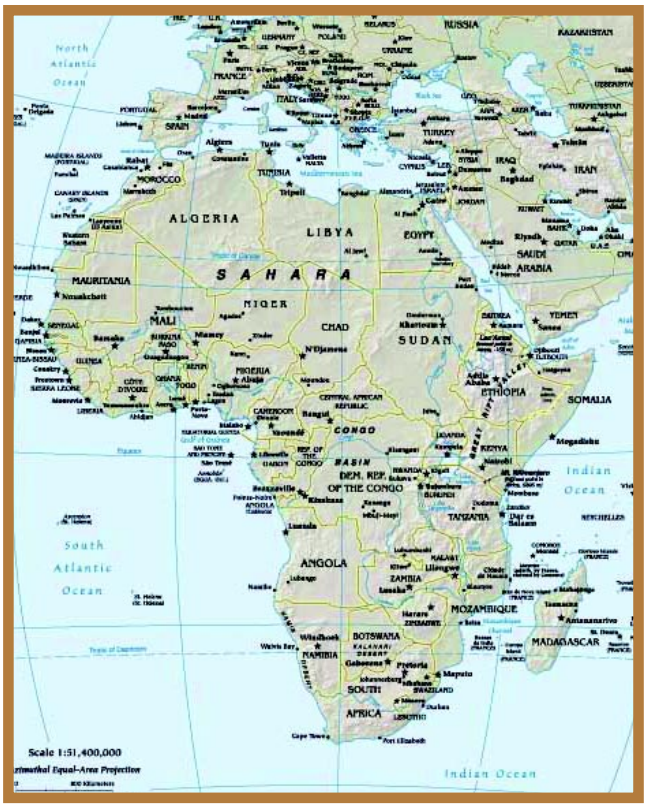
Cost recovery

All public tapstands and private connections are metered and read monthly. Consumers using the public taps pay by the bucket at a rate equivalent to US$0.12 per cubic metre. Those with private connections pay US$0.18 and US$0.20 per cubic metre for domestic and non-domestic connections respectively. Very few consumers are disconnected for non-payment. Connection charges constitute another source of revenue.

These tariffs are set by the government. Although the tariffs are low by international standards, the schemes' revenues currently exceed their running costs. However, the surplus will probably not cover extensions, major repairs, or replacement of the schemes.

Sustainability

These supplies continue to work well. There is a strong sense of social cohesion among the users, good financial discipline and reporting, and the tapstands are kept clean and functioning. However, the people are using much less water than originally anticipated, and so the income is less than planned. For example, a recent research study by WaterAid at Hitosa and Gonde Iteya water supply schemes found that people were only using 8 or 9 litres per day, and even less in the rainy season. In addition to the inadequacy of this volume for people's domestic and hygiene needs,



this low consumption worries the Water Management Boards, whose income is directly proportional to the volume used but whose expenditure is not. It also means that there is surplus water from the sources that is not economically used, for example in horticulture.

In the long term the income will not cover major repair expenses as the systems become older and experience more serious breakdowns. The users told the WaterAid researchers about many factors affecting their consumption and hence the scheme's income, and the study concluded that the best strategies to increase total income would be increased water tariffs (especially for private connections), more private connections, and public education to encourage higher consumption.

Examples: Tereta and Hitosa water supplies

Tereta water supply was designed for a population of 52,000 people in 15 villages, which is a typical size for the schemes in Oromia. Water from three springs flows by gravity through over 60 km of pipelines with 21 reservoir tanks. The people access the water through 50 public tapstands; there are also a few private connections in one small town within the area. During the years 1994-1996, annual income averaged US$4,000 and annual expenditure averaged US$2,000.

Hitosa water supply was planned and implemented using similar principles, and completed in 1996. It serves 70,000 people through 142 km of pipe supplying 122 public tapstands and 506 household connections.

Gravity pipe at Mulanje, Malawi: the new pipe is strapped to the side of the original.

Gravity-flow water supplies in Malawi

The Malawi Government implemented a nationwide programme of gravity-flow piped water supplies from the late 1960s to the mid-1990s. The programme was the brainchild of one senior government engineer, Lindesay Robertson. Several of the programme's professional staff later worked in other countries and wrote books on the subject, so these pioneering schemes in Malawi have had a wide influence in other countries.

As a result of this national programme, Malawi has over 80 rural piped schemes serving a design population of almost two million people. The schemes vary widely in size: one serves over 350,000 people through thousands of kilometres of pipe, whereas others serve one or two thousand people with less than twenty kilometres of pipe. Most are designed to serve under 50,000 people.

Description and project implementation

This was a centrally managed programme, intended to fulfil the government's duty to supply water to as many people as possible. The government engineers developed standards for design and construction, and identified locations that were most suitable for such schemes. Donors, notably the United States Agency for International Development (USAID), provided much of the finance.

Each scheme consisted of one or more intakes and a sedimentation tank, a supply line to one or more main reservoir tanks, and distribution networks to public tapstands. As in Ethiopia, the projects were designed to serve the entire population in the supply area, but only through public tapstands.

The community participation component earned the Malawi programme considerable international praise. The community members did not just contribute their labour, they also took on many of the daily organisation and supervision tasks, and agreed to help maintain the schemes afterwards.

Institutional arrangements and training for operation and maintenance

For each scheme, a main committee, branch and village committees were elected to organise the various parts of the work during construction. After construction, the number of committees was reduced to a main committee, tap committees, and repair teams. All these committees worked on a voluntary basis.

The government appreciated that volunteers alone would not maintain the schemes at an acceptable level. Therefore, it employed monitoring assistants and supervisors stationed in the rural areas, backed up by engineers at the regional and central level as needed. Each scheme was assigned one monitoring assistant, to work closely with the main committee and repair teams. This system worked reasonably well for some years. However, a democratic transition and change of government took place in 1994. The incoming government replaced the previous paternalistic policies with the internationally prevalent principle that the consumers should manage and finance the operation and maintenance. It substantially reduced its own budget allocated to operating these schemes. Many of the monitoring assistants were moved or neglected, and the supply of materials and skilled workers for repairs virtually ceased. So the users have had to take a more active leadership role by default.

As to training, originally the government provided on-the-job training during construction to the main committees and repair teams. Latterly it made a nominal provision for training for these groups, but few courses have been run due to lack of finance. The government also had a strong programme for training and upgrading its own staff, which has collapsed due to lack of finance since the mid-1990s. So now very little training of staff or communities is undertaken.

Cost recovery

When planning the schemes, the government promised consumers that, in return for their work in constructing and managing the schemes, they would not have to contribute cash for operation and maintenance other than for replacing and repairing taps and tapstands and cleaning intakes. The government retained responsibility for meeting all the other cash costs of operation and maintenance. However, it did not include a separate budget for rural piped schemes until 1987: instead it systematically over-ordered construction materials in order to cover operation and maintenance. This was, in effect, a subsidy from the external support agencies.

So, although communities made a large contribution to construction,[1] they do not pay cash for their water and they have also been reluctant to contribute their time and labour for operation and maintenance. This has been for two reasons. First, the post-1994 democratic government has been reluctant to put into practice its stated principle of charging the users. Secondly, the opportunity cost to the community of the time required to maintain the schemes is high because the schemes are large in terms of kilometres of pipe per consumer (typically twice as large as in Ethiopia, for example).

In recent years, some external support agencies have started to help communities rehabilitate a few of the schemes. Those communities are setting their own tariffs (usually an agreed payment per household per year, rather than a metered tariff) with the eventual aim of financial self-sufficiency.

Sustainability

The schemes in Malawi now range in age from a few years to almost 30 years. With schemes of this age maintenance requirements are high, mainly to replace pipes washed away by streams during the rainy season.

The problems in cost recovery described above have affected sustainability. In 1997, a survey of schemes comprising a total of almost 900 tapstands found that less than 50% of the tapstands were supplying water.[2] This indicated a significant decline since the early 1980s when surveys showed over 90% functioning. However, this deterioration is not surprising because, since 1994, the people have had to manage (and, if necessary, finance) the operation and maintenance of their schemes with minimal training or support.

There appear to be two main influences on the viability of the schemes. First, the larger schemes serve people of different ethnic groups and cultural practices, which causes problems when agreeing project management and financial arrangements. According to the same recent survey, these larger schemes have a significantly worse record of maintenance than the smaller, more socially cohesive, schemes.

Secondly, the people are extremely poor and have many demands on their limited supply of cash. If the water supply fails they find alternative sources, even though these are usually distant, low yielding and poor quality, such as scrapes in riverbeds. This implies that they have not received sufficient education about the merits of a piped water supply to motivate them to spend their money on it. In communities where external support agencies have been carrying out such education, the people seem to be more motivated to sustain the supply.

Self-help rural water supplies in Kenya

Kenya has a strong culture of self-help, which has been harnessed for many development activities, especially in rural areas. Looking specifically at water, of the eight million Kenyans who have access to improved water in rural areas, 30% are served by community-managed water supply schemes. Most of these schemes were developed by self-help groups. Many of them were constructed during the 1970s and 1980s and are still working.

Description and project implementation

These self-help schemes differ from those in Ethiopia or Malawi in two important aspects. First, they were designed to provide water mainly to the members of the self-help groups, not equitably to everybody living in the service areas – this highlights the heterogeneous nature of the word 'community'. Secondly, they supply water mostly through household connections, not public tapstands. The water is intended both for domestic consumption and for small-scale agricultural production,[3] and thus has an important economic role for its consumers.

Examples: Chambe, Lifani and Lingamasa water supplies, Malawi

These three medium-sized schemes are typical in that all three schemes are still supplying water to a majority of their intended consumers after 20 to 30 years. However, each is now only partially working (see table). Parts of their distribution networks have been washed away and the consumers have not raised enough money to replace them, nor has the government provided enough maintenance and repair materials.

Scheme name	Date completed	Population served	Pipeline length (km)	No. of tapstands	No. (%) working now
Chambe	1970	30,000	96	270	184 (68%)
Lifani	1977	20,000	100	152	106 (70%)
Lingamasa	1981	12,000	43	118	93 (79%)

[1] Estimated at between 10% and 30% of capital costs, depending on exchange rates and the valuation of rural labour.
[2] Kleemeier (2000).
[3] Studies conducted in self-help water supplies in central Kenya showed that up to 80% of water supplied to households was used for agriculture.

Each self-help group constructs a water supply, typically serving about 300-500 households, with capital raised from its own resources, the government, NGOs and external support agencies. The group members are mostly not the poorest people but the more prosperous farmers, traders or salaried urban employees who retain strong links with the countryside. The group members set the contribution that each household is required to make in order to receive the service. They also decide how much water to make available to other people through public tapstands: some schemes such as Kabuku (*see box*) effectively serve the whole population, while many others do not.

Typically, a gravity-flow scheme consists of a spring or stream intake, a supply pipeline, a reservoir tank and distribution system to household yard taps. A pumped scheme is similar but uses a pump to feed the reservoir tank from the intake or borehole.

Institutional arrangements and training for operation and maintenance

The group members own each water supply collectively. Each member has contributed cash (about US$50 at Kabuku, for example) plus labour to the capital cost of the scheme. The members register themselves as a society, whose constitution sets out rules on membership, governance and ownership of assets and regulates finance, operation and maintenance.

Typically, the members elect a management committee and hold it and the staff accountable through approval of the annual budget. The members set the water tariffs and penalties annually on the basis of projected expenditure for the following year. The staff usually comprises a manager (who is responsible for all the finances and serves as secretary to the committee) and a number of technicians who maintain the pumps, read and service meters, repair leaks and operate the pipe network.

In the case of the better-managed schemes, the members of the group, management committee members and staff all receive detailed and extensive training. This training covers management, by-laws, key features of water supplies, finance and accounting, budget preparation and record keeping, staff supervision, operation and maintenance work.

Cost recovery

On the better-managed self-help schemes, each connection is fitted with a meter that is regularly serviced and read monthly with the householder. Monthly billing, a progressive tariff (typically ranging from US$0.07 to 0.64/m^3) and strict enforcement of payment rules[4] have enabled the schemes to maintain high average collection rates over many years. Non-members also pay a set tariff for water from the public tapstands. This financial discipline, together with each group's authority to set its own tariffs and to set and approve annual budgets, enables income to cover all the operating and maintenance costs.

Sustainability

From the point of view of the group members, these schemes are generally successful and valued. There is cohesion within the group, they pay their bills, and they receive a good service. But the schemes do not serve the needs of the whole population equitably. They are in effect an intermediate stage between community-managed public water supplies and non-profit enterprises such as the Users Associations in Mali.[5] Conditions set for gaining membership into a scheme often restrict membership to about 30-40% of the households within a supply area. Non-members can be served through public tapstands, but these only work reliably in systems with strong financial management.

While Kenyan law requires the self-help groups to be formally registered, there is no specific legislation governing how they work. Since these groups operate in isolation from

Example: Kabuku water supply

The Kabuku water supply is a pumped system. Water from a spring is pumped 2 km up to a reservoir tank; from there it flows by gravity through a 15-km distribution network to 300 yard and house connections serving about 1,800 people and three public tapstands serving 700 people. The household connections supply over 50 litres per person per day.

Kabuku is a self-help project, completed in 1979. It provided some water for nine years thereafter, before failing in 1988. Later, the group members obtained support from the Swedish International Development Agency (Sida) for redesign, rehabilitation, development of management systems and training. By 1993, the project was fully operational.

Kabuku now provides an example of strong financial management. Through metering, effective pricing and collection, the income is reliable. That reliable income enables the system to work well, supplying water to everybody. Its annual income averages US$11,000 and annual operation and maintenance expenditure averages US$9,000. This surplus goes towards replacement and extension of the infrastructure: for example, it was recently used to enlarge the reservoir tank.

[4] For example, each monthly invoiced amount must be settled in full within 14 days of billing.
[5] See Blue Gold Field Note 12: Water Services in Small Towns in Africa: The Role of Small and Medium-Sized Organisations.

government support mechanisms, their institutional viability depends on clear constitutions that define the conduct of business, operations, relations between members, conflict resolution, and rules of leadership and succession.

The groups' financial sustainability is helped by their ability to set their own tariffs. Accurate, clear financial accounts are important to maintain trust among members. Dissatisfaction with accounts has been a major cause of leadership conflicts in some groups.

Technical sustainability depends upon the members maintaining their level of interest from the construction stage through to the operation and maintenance stage. This causes problems in gravity-flow schemes, whose members tend to carry out emergency repairs as needed rather than preventive maintenance. Pumped schemes, on the other hand, require care of the pumps and purchasing of energy. The members establish basic maintenance systems, set tariffs and arrange mechanisms for collecting the income and buying the power.

Lessons from these examples

These community-managed water supplies in Ethiopia, Malawi and Kenya have been operating for years. While the managerial arrangements in the three countries are different, there are some common conclusions that are relevant for other countries and agencies planning similar programmes.

Community management works well in cohesive communities

The cohesion of the community is an important factor in the long-term functioning of these large piped water supplies. In Ethiopia, the people's high level of social cooperation enables very large schemes to be undertaken; in Malawi the more varied ethnic and social composition implies a smaller optimum size for sustainable schemes; in Kenya the self-help schemes serve a slightly different type of community group, not necessarily everybody living in a particular area. In each case the strong cohesion within the group generates a clarity of purpose and a sense of ownership, which in turn improve the sustainability of the system.

Sound financial management, including the authority to set tariffs, is vital

The schemes that aim to serve everybody, such as those in Ethiopia and Malawi, commonly experience low water demand which, combined with low tariffs, generates inadequate income to sustain running costs over the long term. The remedies for this may be to have more household connections and/or to raise the tariffs. However, tariffs can only be raised by the legitimate authority – if that is the government rather than the community, the latter is in a difficult position of financial responsibility without power. In Malawi this difficulty is compounded by the government's unclear policy on setting any tariff for water, which undermines financial sustainability.

In Kenya, the schemes have proportionately more household connections and higher user charges, which the users can afford because the water is used for agriculture as well as domestic consumption. The users also set their own tariffs annually, based on their knowledge of the system's financial position. Provided they are well managed, schemes of this type are more likely to achieve financial sustainability.

In addition to tariff setting, this sound financial management is exemplified by the use of metering and sanctions against consumers who do not pay.

Sustainability depends on paying staff

The schemes in Ethiopia and Kenya employ staff with technical, administrative, and financial responsibilities. Other than some part-time caretakers, the Malawian schemes do not employ any staff. Instead, the volunteers and a government-employed monitoring assistant are supposed to carry out the functions for which people are employed in the other two countries. In practice, these volunteers and staff are not doing the necessary maintenance. The conclusion is that a few community members cannot be expected to donate large amounts of their time over an extended period in order to maintain a public good. Yet schemes need good, reliable workers not just for technical tasks, but also for management and administration.

Managerial and governance training is important

Relevant, practical and well-tailored training seems to have a major influence on chances of success. Suitable training, combined with good management systems, can enable staff with little formal education to operate and maintain a complex water supply. This can be seen especially in Ethiopia and Kenya, whereas in Malawi the absence of training has had the opposite effect.

Targeted training to help community members to assert their governance role in relation to their own community leaders seems particularly important. Empowerment of members is the beginning of the road to success. It is a political process that depends on the local power structures. Other aspects of management, such as proper billing systems, payments and the banking of funds, are arguably secondary to this empowerment.

Community management systems benefit from ongoing support

Community management of piped water supplies is most successful if communities can obtain technical and professional support. This support may not be used often, but the committees must be able to rely on it when they really need it. In Ethiopia, the committees are well supported by local government departments, to the benefit of the schemes. In Malawi, they originally had strong government support but now the quality of their water services has been affected by the declining government budget for rural piped schemes. In Kenya, on the other hand, there is practically no institutional support for self-help water schemes; this isolation may make the schemes more vulnerable to management failure.

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