

Sustaining Rural Water Systems: The Case of Mali

AT ITS COMPLETION IN 1992, THE BANK-FUNDED Mali Rural Water Supply Project was giving about 228,000 people—more than twice the original estimates—access to potable water in about 230 drought-prone rural villages. The project was completed 18 months ahead of schedule at below the estimated cost. An OED audit* in 1996 found that about 90 percent of the water pumps were still operating and that villagers were covering the costs of small repairs.

The project's success derived largely from its careful attention to the choice of technology and to the repair needs of villages, two issues that have plagued most rural water projects in Africa.

The audit cautions that a number of problems are putting sustainability of the village water systems at risk. Most pumps are nearing the end of their useful life, and villagers lack the funds to overhaul them. Improvements in health have also been fewer than expected because villagers mix potable water with contaminated water. The audit recommends taking a more comprehensive approach to rural water supply projects—one that focuses on strengthening institutions, waging education campaigns to promote sanitation and preventive maintenance, and identifying ways to continue technical support to village committees after projects are completed. Some of these measures have already been incorporated in a follow-up project.

Background

Without properly constructed boreholes, rural villages in Mali must rely on contaminated shallow wells, swamps, and creeks for their daily water supply. Following a decade of decreasing rainfall (from the early 1970s to the mid-1980s), when water for household use was hard to find, the government requested funds from the Bank to help ensure that rural communities would have access to safe, drought-resistant water supplies.

The Mali Rural Water Supply Project, approved in 1983, had three objectives: supply water to 215 villages in the district of Kita and 15 villages in the districts of Bafoulabe and Kéniéba; set up operational and maintenance systems to increase the self-reliance of villages; and



strengthen the Direction Nationale de l'Hydraulique et de l'Energie (DNHE) so that it could more effectively plan and manage rural water projects and provide technical assistance. In addition, the project sought to reduce the government's financial burden in maintaining the systems by making villages responsible for part of the cost of handpumps and for all maintenance.

Project staff were aware that technological problems plagued most rural water projects in Africa. In many cases, the handpumps used were either too complex for villagers to operate and maintain or not sturdy enough for constant heavy use. There were very few competent repair technicians at hand, and spare parts were either unavailable or located too far from the villages. In one project, about 90 percent of pumps were inoperable after only one year. These problems were confirmed in 1994, when a Bank-financed study in Africa found only between 41 and 51 percent of handpumps were still operating.

Project Design

Project designers tried to address each of the problems found in earlier projects. A sociological, economic, and epidemiological baseline study which, according to government officials, was the first carried out by any such project in Mali, provided an in-depth understanding of local conditions and of the strengths and weaknesses of available pump technologies. The findings helped guide Bank-financed health work in the region and helped project staff set up village water committees, determine committee contributions toward purchasing handpumps, and establish a fee structure for pump repairs (setting limits on what project-trained repairmen would be allowed to charge).

To ensure the maintenance of the water points, DNHE trained 300 villagers in buying quality spare parts and 50 artisans in pump repair, providing tools and motorbikes for travel to water points. The DNHE Kita office bought a large stock of spare parts, which it provided on credit to a network of depots, and employed two handpump specialists. The project office in Kita helped with repairs that were beyond the skills of the rural population. A group of US Peace Corps volunteers worked with the artisans, helping to check the inventory of spare parts issued.

Results

In many ways, the project achieved an enviable track record of success. The boreholes and handpumps ensured a year-round source of water supply in a region buffeted by cyclical drought. The project built 628 boreholes, almost twice the 340 originally estimated, and gave access to clean water to about 228,000 rural villagers, more than twice the 110,000 planned at the outset.

Four years after the project closed, the audit team visited 15 villages and found that 20 of the 22 boreholes were still operating. DNHE staff and the volunteers noted that artisans were given sufficient training to handle all but the most difficult problems. Among the six largest externally financed handpump projects in Mali, the Bank project consistently had the highest percentage of handpumps in operation.

A number of factors had a positive influence on continuity in the operation of the handpumps: the network of spare part depots supplied on credit by the project; the ability of project-trained artisans to repair the pumps; periodic visits by project officials from the Kita base; the existence of water committees (when they performed properly); and on-site back-up by volunteers.

However, at the time of the audit, preventive maintenance was being carried out in only 1 of the 15 villages. Pumps in the more populous villages required repairs as often as twice a year, and only one of the pumps visited had not required any repairs at all.

Challenges

In the past, the Bank considered inadequate infrastructure to be the main constraint facing the urban water sector. Successful projects were those that built water systems and increased supply. But it eventually became apparent that increases in water supply were not sustainable and that sector organizations remained weak. The Bank began to focus more closely on supply organizations and on the broader enabling environment, taking a more comprehensive approach to water projects. A similar shift in focus is now needed in rural water supply projects.

Table: Villagers' access to water

Number of villagers per pump	Pump discharge rate	Hours per day handpump normally used	Gross availability	Net availability (75% of gross)	Maximum water/person/day possible
363	0.7-1.0 m ³ /hr	14	10-14 m ³	7.5 m ³	20.66 liters

The High Costs of Supporting the Local Manufacture of Handpumps

THE PROJECT CHOSE THE INDIA MALI BRAND pump because its sturdy yet simple design was appropriate for village-level operation and maintenance. It was also the only pump manufactured in Mali. While it is still too soon to say how the pump's use will benefit local enterprise in the long term, its cost to the project and its beneficiaries has been significant.

It was assumed that spare parts would always be available from the *Entreprise Malienne de Maintenance* (EMAMA). But EMAMA has been partly privatized and its factory management changed. In the process it has lost its creditworthiness and key personnel, as well as much of its knowledge and contacts. The factory is unable to supply the spares that have been ordered, and its survival as a commercial enterprise is in question. It is possible to buy complete pump units and spare parts from India and have them shipped to Mali for half what it costs to manufacture them in Mali. Handpumps and spares are imported tax free because it is assumed that they will be used in poor rural areas. But the steel that EMAMA imports from Europe for local casting is heavily taxed, ostensibly because the metal can

potentially be used to produce any type of manufactured product.

Although the artisans are generally capable, most villages have difficulties in raising the money for repairs. Moreover, with the closing of the Kita base, repair costs are likely to rise and quality of repair may decline. The Kita office purchased a five-year supply of parts, but once that inventory is exhausted, the cost of most parts is likely to triple and the supply of spare parts will no longer be assured. Without oversight from the Kita office, there is no system of quality assurance or monitoring of repair costs.

Even more worrisome is the approaching end to the useful life of the pumps. Procurement specifications required pumps to have a ten-year life span, and many of the pumps are nearing this limit. Galvanized pipes used in the boreholes have already exceeded their normal seven-year life span. Thus, replacing or overhauling the pumps and tubing presents a major challenge to the long-term sustainability of the rural water systems.

Finally, because preventive maintenance is still not part of village culture, routine maintenance is not being carried out and the pumps are used almost incessantly. As a result, the most expensive components wear out or break prematurely.

Coverage

Although the project reached twice the number of beneficiaries planned, coverage remains insufficient. Serving 228,000 people at 628 water points means that, on average, 363 people share a single handpump, with everyone tending to draw water at the same times of the day.

Providing 20 liters of water per person a day, the maximum allotment possible (see table), was only feasible through a staggered schedule, which villagers could not follow because of their agricultural work and other tasks. These constraints prevented all villagers from having sufficient access to clean water.

Health

The project's impact on health and sanitation was below its potential because villagers continued to use contaminated water from traditional sources during and after the rainy season, for as long as the water lasted. It takes far less work to obtain water from a shallow well than to use handpumps, and if households must walk long distances to the handpump, they are more likely to prefer surface water when it is plentiful. Also, because the health benefits of clean water are not yet fully understood, many households continue to contaminate

water by allowing animals to come into contact with it or by mixing clean with contaminated water.

Village Water Committees

DNHE established water committees, encouraged committee members to raise counterpart funds, and helped them sign maintenance agreements. However, once the handpumps were installed, the committees were left on their own. Without continuing support, most committees ceased to function. In only 1 of the 15 villages visited by the audit mission was the local water committee still active and functioning. The committee met regularly, raised and managed repair funds, and administered repairs. Committee weaknesses elsewhere might have been overcome if better use had been made of active project beneficiaries who understood the importance of timely maintenance, adequate fundraising, and other project-sponsored actions.

Distribution and Maintenance

The project aimed to transfer the distribution of spare parts to the private sector and provided a substantial inventory of parts to hardware stores. But the distribution system failed because the stores refused to become involved with the local depot system, as the Kita office

had planned (the depots were needed to make parts available near the villages). The stores, finding parts difficult to warehouse and unprofitable to sell, participated only until the initial donated inventory was exhausted. Sale volumes remained low because villagers bought parts only if the entire pump broke down.

The Mali project's handpump maintenance system, on the other hand, worked because repairers received continuing follow-up visits from the repair consultant and the DNHE Kita base staff. But these visits stopped when the consultant's contract ended and DNHE closed the Kita base. With the loss of this support, the project's main achievements in institutional development—establishing a core of trained repair artisans and technicians—may be lost.

Recommendations

Health. At the outset, Bank staff considered technology to be the major obstacle to the project's success. With the benefit of hindsight, the long-term challenges facing the project are clearly educational and organizational. Although the project improved living conditions by providing drinking water to many rural villages, villagers do not always drink the clean water, particularly when other (albeit contaminated) sources are more readily available. Adequate health education campaigns and simpler systems for fetching water are two essential ways of improving the health of villagers. For example,

in the largest villages, it may be possible to use simple motorized pumps and mini-networks to make more water accessible to more people in less time. There is no doubt that, had potable water been available from standpipes (shared faucets), the project's health benefits would have been greater.

Sustainability. Support to community organizations should cover the full implementation period. If arrangements for follow-up after the project's closing are necessary, the Bank may need to take additional post-implementation responsibilities. In the case of the Mali project, more time was needed to impart the required instruction on health and hygiene, to set up a sustainable spare parts distribution system, and to provide technical support to artisan handpump mechanics.

In rural water projects, the Bank may need to work through nongovernmental organizations, particularly if outside support is needed to maintain handpumps after the project is closed. The long-term needs of committees responsible for keeping water points clean and for performing routine maintenance demand sufficient priority. The committees would have been more effective in their extension work if local residents had been more involved in running them.

Future projects will need to make sure preventive maintenance becomes part of village culture, so that routine maintenance can be carried out as a more integral and ongoing part of rural water supply activities.

Précis

*Performance audit report: "Mali: Rural Water Supply Project," by Ronald Parker, Report No. 16511, April 1997. Available to Bank Executive Directors and staff from the Internal Documents Unit and from regional information service centers, and to the public from the World Bank InfoShop:
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