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Decentralizing water supply services in developing countries: factors affecting the success of community management

DENNIS A. RONDINELLI

University of North Carolina

SUMMARY

This article examines the problem of extending access to potable water through conventionally controlled government services and describes the roles of non-governmental organizations and community management associations in improving service delivery and maintaining local water systems. Six sets of factors that are crucial to the success of community management are identified: adequate incentives, sufficient skills and resources, appropriate processes for water systems operations and maintenance, effective interorganizational relationships, appropriate technology, and effective systems of monitoring, evaluation and feedback. The components that must be taken into consideration in designing and implementing programmes for decentralizing water supply systems through community management are set out.

The social and economic benefits of providing greater access to potable water in developing countries are now widely recognized. Extending water services saves people considerable time and energy in obtaining water from traditional sources (Tavangar, 1989). But it also allows households to use more water for hygienic and horticultural purposes, thereby increasing labour productivity and reducing the human suffering from water-related diseases, which cause a majority of illnesses in developing nations (WHO, 1980). During the 1980s, more than 25,000 people—mostly children—died every day from diarrhoeal diseases brought on by drinking or bathing in unsanitary water and by poor hygienic practices.

Because of the direct and visible relationships between access to potable water and improvements in health and productivity, international assistance organizations and governments in developing countries have invested hundreds of millions of dollars during the past several decades to extend potable water to rural communities. At the beginning of the United Nations International Drinking Water Supply and Sanitation Decade (IWSSD) in 1980, the World Health Organization estimated that about 1.8 billion additional people would have to receive access to potable water in order to meet IWSSD goals. The costs of providing adequate water to meet IWSSD targets were estimated at U.S. $30 billion in urban areas and nearly U.S. $16 billion in rural areas (WHO, 1987). Rough estimates place the amount that governments

Professor Rondinelli is the Director of the International Private Enterprise Development Research Centre at the UNC Business School at Chapel Hill, Campus Box 3440, University of North Carolina, Chapel Hill, NC 27599-3440, U.S.A.

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and donors are now spending on rural water supply at about U.S. $1.5 billion a year (Briscoe and deFerranti, 1988).

Despite widespread recognition of the importance of improved water and sanitation, and heavy investment by international donors and governments in developing countries in extending water supply systems, more than half of the rural population in developing countries still lacks access to clean drinking water. The rapid pace of urbanization in developing countries is also increasing the demand for water in peri-urban communities and cities. The urban population in developing nations is expected to grow by about 51 million a year over the next 40 years (UNCHS, 1987). The World Health Organization (1987) estimated that 25 to 30 per cent of the urban population in Latin America, Africa and the Middle East lack access to potable water. More than one-third of the urban population in Asia and the Caribbean are not served.

EXTENDING COVERAGE AND IMPROVING SUSTAINABILITY

Experience suggests that, in the future, central government ministries and agencies in developing countries will find it increasingly difficult, if not impossible, to extend water and sanitation services to rural and peri-urban areas through conventional public service delivery arrangements (Therkildsen, 1989). The World Health Organization (1986) found that in African countries, water supply has been constrained severely by national funding limitations, insufficiently trained personnel, frequent logistical problems, and poor operations and maintenance (O&M) practices. Inappropriate legal and organizational arrangements, insufficient means of recovering costs, and inadequate planning and design also limit the ability of African governments to extend water supplies.

Examples of ineffective central management of water supply services are numerous. Evaluations of rural water and sanitation projects in Honduras, for example, found the government's responsibilities for water delivery were unclear and confused because management of the sector was so fragmented among many ministries and agencies that did not communicate with each other. Rural development agencies and the Ministry of Health, both important participants in water service delivery, would not work together (Edwards and Salt, 1989). In Jordan, the planning of water resource development projects was undermined by rivalries between the Water Authority of Jordan and the Jordan Valley Authority. In Egypt, responsibilities for decision-making, financing, quality control, and operations and maintenance of water supply systems became so fragmented and confusing that they undermined efficient operation of the system. Rural water supply functions were carried out by national ministries, agencies in each governorate, and local organizations in municipalities with little or no co-ordination among them.

The high costs and administrative complexities of delivering water in rural and peri-urban areas through central ministries and agencies have led many governments to look for alternatives (Rondinelli, 1990b). Self-help programmes, informal sector participation, privatization of services, user-charge and cost-recovery financing, or public-private partnerships are some of the ways in which governments in developing

countries are experimenting to reduce the costs and increase the efficiency of extending water supplies.

But extending water systems into communities that are not now served is only one of the problems facing developing countries. Maintaining the systems after they are installed is equally important. In the past, up to 70 per cent of the systems that had been installed were not functioning soon after construction was completed (Black, 1989). In many countries they were not being used, or were being misused, by the intended beneficiaries because of ineffective operation or lack of maintenance. The inability of national governments to repair and maintain water supply systems undermined the impact of international funding for rural water supply.

The breakdown of misuse of water supply systems in developing countries can be traced to a variety of causes, but a primary factor is the lack of effective institutional arrangements for community management (Yacoob and Warner, 1988). Although community participation and user education are now considered crucial for sustaining water supply systems, primary responsibility for water delivery and system maintenance remains with central government ministries or agencies that still give little attention to community management.

The dominant role of central government agencies in providing water, the rising costs of extending services and maintaining existing systems, and tight financial constraints imposed by debt-repayment and structural adjustment policies have all combined in recent years to restrict severely the ability of central governments in most developing countries to meet growing needs for water.

ROLE OF COMMUNITY MANAGEMENT IN WATER PROVISION

Although technology remains an important factor in extending water supplies, the crucial challenge facing governments in developing countries is no longer the technical problem of bringing water to people, but the organizational problem of bringing people to water. The most important challenge of the 1990s is finding effective means of organizing people in rural and peri-urban communities to finance and manage local water supplies effectively, through water users' associations or community development organizations, with appropriate assistance from national agencies, local governments, non-governmental organizations and the private sector.

History demonstrates that for centuries rural communities have managed their own scarce water resources (Yacoob, 1989). They have established rules for water use and roles for water resource maintenance. When responsibility for potable water systems was assumed by national governments, however, community capability for water management was usually ignored. Little effort went into providing assistance to communities to manage water systems effectively (Briscoe and deFerranti, 1988). Where people perceived water supply systems as being the government's and not their own, they felt little or no responsibility for maintaining them.

More than 20 years of experience with water supply projects in developing countries shows clearly that if water systems are to be extended, maintained and used effectively, new relationships must emerge among national and local government agencies, community users associations, and non-government organizations (Briscoe and deFerranti, 1988).

Improving efficiency, effectiveness and sustainability

A recurring lesson of experience is that problems of implementation and sustainability arise frequently when project designers either do not know about, or simply ignore, local conditions and consumers' preferences. Community participation and management are identified repeatedly in evaluations of water supply projects as primary factors affecting sustainability (McCommon *et al.*, 1990; Narayan-Parker, 1988).

In addition to improving the sustainability of water supply projects, community management can make other important contributions. When community management is effective, it can: 1) increase the motivation of local groups to adopt water supply systems and to maintain them; 2) reduce costs of construction, operations and maintenance; 3) provide community residents with the opportunity to monitor breakdowns and determine the need for repairs, tasks that they can perform more effectively than government bureaucracies; 4) allow communities to take more expeditious action on maintenance and repair than can government bureaucracies; 5) build community skills for water systems maintenance and for implementing other types of community development activities; and 6) allow people to express their needs more effectively to central and local government officials (Rondinelli, 1990a).

The concept of community management

Community management programmes have evolved over the past three decades from paternalistic schemes for obtaining free labour to those that allow and encourage community control (Holdcroft, 1978; Korten, 1986). From the early 1960s, most water supply projects were carried out by central government agencies with only limited community participation. Most governments and international assistance organizations perceived of participation only as using voluntary or low paid, unskilled, village labour in water system construction. During the late 1970s and early 1980s, the concept of participation expanded to include consulting villagers about some aspects of design and training village caretakers for some aspects of monitoring and maintenance (Yacoob, 1989).

During the 1980s, the concept of participation evolved further to mean transferring ownership and responsibility for financing and managing water systems to local communities. Programmes for promoting community management went beyond eliciting the participation of a few local officials or village elders in water supply projects designed and implemented by the government. Many of them now transfer to community groups control over the operation, maintenance and use of the system and hold them accountable for maintaining it (Korten, 1986; McCommon *et al.*, 1990).

This new concept of community management implies a different set of relationships between local communities and the government. Governments must become facilitators of community management rather than providers and financers of water services. They must provide training, information, and technical and managerial support to community organizations, and help with the technical aspects of system design and construction (Briscoe and deFerranti, 1988).

Organizational arrangements for community management

Because national ministries and agencies have been primarily responsible for water services, progress toward institutionalizing community management necessarily depends on decentralizing responsibility for water delivery and maintenance (Rondinelli, 1990b). But decentralization is only one requirement for promoting community management. In themselves, formal declarations of decentralization and the restructuring of water agencies are insufficient (Therkildsen, 1989). The other critical requirement is creating or strengthening community organizations that can effectively take responsibility for water system construction, operation and maintenance.

Various organizational arrangements are now being used in developing countries to promote community management. The primary approach is through self-help organizations such as water users' associations and community development organizations in rural and peri-urban communities. Local governments in urban centres, and non-government organizations and private enterprises in both urban and rural areas, can also help community groups gain control over water systems. At the same time, past experience with water supply projects indicates that governments can support community participation and management in water system construction, operation and maintenance by decentralizing the structure of national water service agencies to make them more effective in dealing with local problems and more responsive to consumer needs (Arlosoroff *et al.*, 1987; Hodgkin, 1989).

The most appropriate mode of water service delivery depends on a variety of factors such as the size of the community, the characteristics of the population to be served, the social cohesiveness of community residents, the characteristics of the water supply system, and the degree of national and local political commitment to meeting the needs of the rural and peri-urban population for potable water.

FACTORS AFFECTING SUCCESSFUL COMMUNITY MANAGEMENT

Although few doubts remain about the contribution of community management to the efficiency and sustainability of water supply projects in rural and peri-urban areas, much remains to be learned about how to make community management work more effectively.

Experience with internationally funded water supply projects in developing countries identifies six sets of factors (listed in Table 1) affecting the success of community management.

1. Appropriate incentives must be available for individuals and groups to participate in or manage community water systems, and for government agencies to provide assistance to them

Experience with extending water supply in developing countries underscores an important lesson that is often forgotten in the design and implementation of internationally funded projects. Although most people act to protect their own interests, they will—when properly motivated—participate in activities that also promote community welfare. The incentives for co-operative behaviour, however, must be strong enough to overcome the individual and family costs of participation. Programmes

Table 1. Factors affecting community management of water supply

Factor	Components
1. Adequate incentives	Health and convenience benefits of access to potable water Time and money cost savings of access Ownership and control of water systems by community Formal recognition and appreciation of participants in water systems O&M Bureaucratic rewards for government officials to provide support for community management
2. Sufficient skills and resources	Training of community management participants in O&M and financial functions Assignment of field agents and extension workers from national agencies to work with community management groups Encouragement of non-government organizations to provide management assistance
3. Appropriate processes	Local campaigns to organize community management groups Procedures for consultation and participation of community groups in – water system planning and design – siting facilities and water supply outlets – organizing local labour and material contributions for construction – organizing community management committees or water user associations – contracting for O&M – training and information to support local O&M functions – performance evaluation Procedures for turnover of ownership of community water systems after construction Procedures for decentralization of responsibility for water supply operations to community management associations

Table 1. (*Cont.*)

Factor	Components
4. Effective interorganizational relationships	Support from national government agencies and ministries Co-operation among community organizations at local level Assistance from non-government and private voluntary organizations Co-operation between community management associations and local government officials
5. Appropriate technology	Locally adapted pumps and equipment Efficient spare parts storage and distribution system
6. Effective system of monitoring, evaluation, and feedback	Locally organized and supervised system of monitoring labour contributions for construction and maintenance Efficient national and local records system for O&M Effective system for evaluating health and economic impacts of potable water supply Efficient system of billing and revenue collection

for promoting community management must emphasize the benefits of local control early in the organizational process.

The economic benefits of access to potable water are strong incentives for community participation and management. When people lack easy access to water in their communities it is not only a threat to their health, but it also severely constrains household economic production. Whittington and his associates (1988, p. 27) found, for example, that when the water delivery system in Newalla District in Tanzania fails because of lack of fuel to operate its generators, one-quarter to one-third of the average household's daily labour must be allocated to collecting water. Villagers must either buy water from vendors at a high cost or fetch water from traditional sources—rivers, streams, ponds and old wells. When they must purchase water from vendors, some villagers pay the equivalent of up to one day's agricultural wages for a 20 litre bucket, which is only about one-quarter of the amount that a family normally uses. 'The traditional sources are typically five to ten miles away and women in many villages spend much of the day collecting one bucket of water for their families,' Whittington observed. 'The average time of a trip from the home to the traditional source, waiting in the queue, and then returning home varies from about 7 hours in Mnyambe and Nanda to 11 hours in Mkonga and Juhudi.' Even after the long trip, most women return with only one 20 litre bucket of water. The studies in Newalla District found that most households placed a high value on improved water delivery and were willing to pay for the operation and maintenance of a project that delivered water to village kiosks.

In many Latin American countries, the economic incentives for participating in the construction and maintenance of community water systems are visible and direct. In Ecuador, for example, each household contributes labour for constructing piped water systems in return for a yard connection and in lieu of paying installation fees (IRC, 1988). This is a substantial saving for poor families. Communities maintain the systems through local water boards that collect water fees from each household and installation charges for those who join the system after initial construction. The high level of participation and management keeps costs relatively low, undoubtedly a major incentive for most people. Communal participation reduces construction costs alone by nearly 18 per cent.

Ownership and control of the local water delivery system also seems to be an important incentive for motivating local residents to participate in managing and maintaining it. The failure of the Tanzanian government to turn over the ownership of some of the water schemes constructed with Danish aid funds undermined the contracts that village water committees made with the Water Department to operate and maintain the systems (Mujwahuzi, 1985). People thought of the water system as government equipment and felt no obligation to monitor breakdowns and make repairs. In contrast, evaluations have found that one of the strongest motivators for communal associations to manage irrigation water projects in the Philippines was the government's policy of transferring ownership of the system to the associations after facilities were constructed (Reyes and Jopilla, 1986). The associations were given clear authority to own and manage their irrigation systems and the government emphasized that its role was only to provide assistance for organization and construction. The government provided loans to irrigation users' associations to pay for construction. The associations were required to organize and register as legal entities, provide contributions for construction, repay the loans, and maintain the systems after they were completed.

In addition, social and symbolic rewards are also incentives for community participation. Studies in Sierra Leone and in other African countries indicate that immediate, visible rewards, such as formal recognition by community or government leaders at village ceremonies, play an important role in eliciting community participation and keeping volunteers motivated. Well-opening ceremonies that are part of village festivals or 'gala days', and at which water committee members receive certificates and formal recognition, are greatly valued in Sierra Leone and in the Sudan (Yacoob *et al.*, 1987; McGowan and Burns, 1988). In the Sudan, day-long community events are held after water facilities are completed and extension training has been provided for women's groups on the healthful use of water and to men's groups on water system maintenance. These recreational events such as puppet shows, dramas, sports competitions and poetry contests provide entertainment and attract attendance. But these recreational activities are supplemented by exhibits of technical materials and spare parts. The water committees also disseminate information about water equipment, operations and maintenance procedures, and health and sanitation practices. The community events not only motivate participation but formally recognize those who complete extension training (McGowan and Burns, 1988).

Equally important are incentives within government for bureaucracies to encourage and support local participation. If officials and staff of government bureaucracies perceive community management or control as a threat to their functions, budgets or powers, they are unlikely to provide the technical, financial and administrative

support that is usually essential to efficient and effective community management (Reyes and Jopillo, 1986).

2. Appropriate skills and resources for community participation and management of water systems must be developed or strengthened

Although local communities in most developing countries have the potential capacity to manage local water systems, community management is not likely to be effective unless action is taken to organize community associations for this purpose and help them attain the basic skills and resources to carry out their tasks.

Community management failed in many villages in Tanzania because the government failed to provide manuals or to train community residents in basic principles of repair and maintenance (Mujwahuzi, 1985). In contrast, the skills of farmers to manage and maintain irrigation water systems in the Philippines were developed by organizers from the National Irrigation Administration initially by eliciting the farmers' participation in design and construction activities. They engaged the farmers 'in simple but tangible tasks such as collating the documents needed for the association's registration as a legal entity ... Later, they were involved in more complex activities such as negotiating with peers for rights of way for the canals and structures, and forming themselves into small groups to negotiate with NIA for a contract to construct small structures in the system or excavate a particular canal section' (Reyes and Jopillo, 1986, p. 115). This on-the-job training also developed leadership skills among some of the farmers. Many later took a leadership role in the communal associations. Evaluators point out that 'in accomplishing these tasks, farmers learned the strategies that work best to accomplish certain jobs, including how to mobilize and make joint decisions with their peers'.

Where governments invested the time and energy to develop the skills, knowledge and resources of villagers to operate and maintain water systems, community management was more successful. In the Tunisia Rural Potable Water Supply Institutions Project, for example, training has been a major focus of activity for both provincial government personnel and local community water association members. Provincial government engineers, sociologists, extension agents and health specialists have received short-term specialized training in Tunisia, Egypt and the United States. Topics have included community development, health and hygiene education, water system design, maintenance planning and the use of microcomputers. These civil servants have then initiated regular ongoing training for local community members such as association presidents, treasurers, pump operators and village health workers. Training focused on small groups in multiple sessions with regular follow-up (Jennings *et al.* 1989.)

The UNDP-supported South Coast Handpump Project in Kenya built its community participation and management programme on the long tradition of self-help reflected in the Harambee movement. But the project's managers made provisions for engaging a non-governmental organization—the Kenya Water and Health Organization (KWAHO)—to organize and train community groups, and especially the women, to participate in the project (Narayan-Parker, 1988). KWAHO used a liaison team of one man and one woman to train five local women as village extension workers in community development and in the maintenance and use of water systems. The seven team members then trained other village women, using

a manual developed by the United Nations. The KWAHO teams helped villagers to organize themselves into water committees, which raised contributions for pump maintenance and repairs. KWAHO extension workers also trained women to use water effectively for household and horticulture purposes.

3. Appropriate and effective processes must be developed for water system operations and maintenance, and the process must be institutionalized within the community

Developing capacity for community management of water supply systems also takes substantial investment in formulating and institutionalizing effective processes for participation. Experience with water supply projects indicates that procedures must be established for involving community participants in system planning and design; siting facilities and water supply outlets; and organizing local labour and material contributions for construction tasks. Effective community management also depends on establishing effective processes for organizing village or community management committees or users associations, for contracting O&M activities, for providing training and information on O&M operations, and for evaluating performance.

A five-step process for organizing village water committees contributed to the success of community management in the South Coast Handpump Project in Kenya (Narayan-Parker, 1988). The first stage included a fact finding mission that allowed extension workers to discover information about water sources, population characteristics, settlement patterns and community preferences by interviewing local leaders, local government officials and community residents. As in the Philippines, this process of community consultation helped designers choose sites, clarify land ownership issues, and discuss the nature and functions of water committees (Reyes and Jopilla, 1986). In Kenya, this first stage was also used to get residents to select water committee members. During the second stage of the process, five people were selected from the water committees to act as pump caretakers. The extension workers helped the committees to open bank accounts, collect construction materials, assist project drilling teams and construct the pump apron. The third stage of the process focused on training pump caretakers and actually installing the handpumps. In the fourth stage, after the committees were established and began collecting money, the project transferred ownership of the pumps to the water committees. The fifth stage of the process consisted of community operation and maintenance of the completed systems and performance monitoring and evaluation by KWAHO, a non-government organization. On average, the entire process took three to six months prior to construction of the pumps. Active follow-up assistance was provided for an additional six months after the pumps were installed, and intermittent assistance was provided for about a year.

Procedures for allocating responsibility for operations and maintenance are also crucial for successful community management. Village water projects in Tanzania supported by DANIDA, the Danish aid agency, required village governments to sign a contract with the national water department after the project managers explained the water supply scheme to villagers at community meetings. The contract committed the village to participating in construction, operation and maintenance of the water scheme and specified obligations and responsibilities (Mujwahuzi, 1985).

These procedures give community residents a clear understanding of the allocation of obligations and responsibilities between the community and the government, pro-

vide users' associations with guidelines for action, and identify the resources needed by the community to maintain the water system (Jordan and Capul, 1988).

4. Co-operative organizational relationships must be developed through which individuals and groups can participate in planning and managing water systems and government agencies can provide assistance

Co-operation among organizations within communities is essential to effective community management. In the Yemen Arab Republic, for example, Hodgkin (1989) noted that maintenance problems arose in communities where ethnic or class conflicts undermined the ability of development associations to mobilize resources. Because of social conflicts, several villages connected to the same community water system were unable to agree on how to apportion maintenance responsibilities and costs. In some villages, individuals and groups who stood to gain by providing water from private sources opposed the introduction of community water systems.

Co-operation between national and local government agencies and community associations also seems to be essential, regardless of the way in which services are extended. Community self-help has rarely been successful without support and co-operation from public agencies. Government agencies have sometimes served as catalysts for organizing the community to participate and for training local leaders. These functions can be vital in initiating and sustaining community participation. But even when services are provided entirely by public bureaucracies, some degree of community participation is crucial for informing public officials of the needs and desires of local residents and for improving the efficiency and effectiveness of water delivery (Rondinelli and Cheema, 1988).

Creating or strengthening co-operative relationships among organizations is most critical when community groups take primary responsibility for managing water systems. The community drinking water project in Igboho, Nigeria, for example, was initiated and organized through a community association, the Ifelodun Omo Igboho (IOI), which was heavily involved in community development. Although the project was carried out primarily through the leadership of IOI, the town received substantial assistance from the Self-Help Section of the Ministry of Information, Social Development, Youth, Sport and Culture, which provided a grant to build a dam. In addition, the regional water corporation provided technical assistance in locating, constructing and repairing the dam. Evaluators observed that the Igboho project was an excellent example of 'community initiative taking, a demonstration of community enthusiasm, a manifestation of mutual trust between elites and traditionalists, and effective co-operation between government and community' (Egunjobi and Maro, 1985, p. 46).

Experience indicates that any programme to increase rural or peri-urban communities' access to water services will involve a complex set of relationships among these and other participants. Community management of rural water supply projects in Kwale, Kenya, for example, was effective because the community and the project received support from the national government and local authorities. The concept of partnership was crucial to maintaining a smooth-working relationship among the organizations involved in the projects. 'Kwale was able to achieve partnership between government and an NGO, between a number of donor agencies, and most importantly, between the government and local communities,' Narayan-Parker (1988,

p. 25) observed. 'This partnership was based on mutual respect, shared decision-making, two-way information exchange, negotiations and defined responsibilities. No partner dictated to others what needed to be done.'

Successful community management depends in large part on finding ways of reconciling the interests and forging effective and mutually beneficial linkages among participating organizations (Montgomery, 1988). New incentives for co-operation may be needed. New ways must be found for combining the resources and skills that each group possesses in coping with problems and in carrying out tasks. Creating and maintaining open systems of communication and exchange of information, clearly defining rules and procedures for implementation, eliciting participation by those whose interests will be affected by water supply programmes, and fixing responsibility and delegating authority for carrying out a programme have been found to be essential for co-operation (Cernea, 1988).

5. Appropriate and efficient technology must be available to allow communities to manage water supply effectively

One of the enduring lessons of experience with water supply projects during the 1960s and 1970s was that community management was difficult or impossible with the pumps and equipment imported from western industrial countries. Most of the pumps were made of materials that broke down easily in the climates and under the conditions of use in developing countries. Spare parts were difficult to obtain in a timely manner, and repairs and replacements were costly. Often, maintenance required specialized knowledge of the equipment and special tools that were not available in rural areas.

In India and Bangladesh, decentralization of maintenance functions did not become feasible until heavy steel pumps imported from the United States and Europe were replaced with the India Mark II Deep Well Handpump. The Mark II was a sturdier and easier-to-repair version of cast iron copies of European and American pumps that had originally been used in India's rural water supply programme (Black, 1989). Basic maintenance of the Mark II can be done by village caretakers, and more extensive repairs can be made by area mechanics. Indian engineers have continued to make modifications on the Mark II to make it easier for villages to maintain the pump.

Similar lessons emerge from experience in Africa. Effective community management of water systems in the South Coast Handpump Project in Kenya depended on the emergence and adoption of a sturdy, reliable, and easily repairable pump, the AFRIDEV. This 'village level operations and maintenance' (VLOM) pump had plastic components that could be manufactured locally. 'Changed design, especially of down-hole components, and increased use of abrasion- and corrosion-resistant materials have made the AFRIDEV sturdy,' evaluators found (Narayan-Parker, 1988, p. 9). 'This also makes it easy to dismantle using a spanner and a fishing hook. The pump is appropriate for depths up to 45 metres. Local manufacture and strict quality control ensures availability of spare parts.'

Community management of water supplies in Burkina Faso depended in large part on the selection of the Vergnet pump that was relatively light and from which the cylinder could be pulled from the well without heavy lifting equipment. Village caretakers could easily do routine maintenance. Worn parts could be replaced by

trained area mechanics. Spare parts could be purchased by village water committees from local traders at controlled prices (Arlosoroff, *et al.* 1987).

Developing a reliable system of spare parts provision is also a basic element of appropriate technology and an essential condition for community management. Village Water Committees in Tanzania found it difficult to honour their contracts to maintain local systems because of the lack of spare parts (Mujwahuze, 1985). In India and Bangladesh, community management became more effective when local shops and national manufacturers produced and distributed spare parts, and village caretakers could purchase them in the local bazaar rather than depending on government distribution systems (Black, 1989).

Drawing on numerous evaluations of water supply projects, Tavangar (1989) found that the most successful ones had distinctive characteristics. They offered a variety of technology options from which local communities could choose, including improved traditional sources of water, handpumps, diesel-, wind-, or solar-powered pumps, communal standpipes, private yard taps or house connections. The evaluations showed that it was often more effective to build on existing technology, that is, to improve the operations of existing systems or upgrade technology one step, than to introduce entirely new technologies. The most effective technologies were those that the users preferred, based on their own cultural practices, family needs, religious beliefs and economic circumstances. But in successful projects, the designers did not make technology their primary objective and did not allow technological issues to dominate or preoccupy activities intended to improve access to potable water. Moreover, they considered operation and maintenance requirements when selecting a technology. Finally, designers of successful projects used appropriate technology to raise the prospects for sustainability.

6. Monitoring, feedback and evaluation systems must be developed or strengthened to ensure effective and efficient community management

Two major advantages of community management are: first, the increased willingness of local residents to contribute labour and financial resources to constructing water systems if they perceive them as their own; and, second, the superior capacity of local residents—especially in small towns and dispersed and isolated rural villages—to monitor operations and to take expeditious action to repair equipment. But effective community management depends on developing and using monitoring, evaluation and feedback procedures to ensure efficient operation and maintenance.

In the Wonging'ombe rural water supply projects in Tanzania, steering committees were established at divisional, ward and village levels to organize the participation of villagers in various aspects of system planning, construction and operation and to provide feedback to UNICEF and government agencies. The division committees met fortnightly and village committees daily during construction. 'Being closer to the community, the committees dealt mostly with practical matters on a day-to-day basis, such as organizing the trench digging schedule, fixing times and dates, also boundaries, in consultation with neighbouring villages, checking and distribution of tools and ensuring general completeness of the exercise in all villages throughout the project area,' Blakely and his associates (1985, p. 38) observed. Similar procedures were used to monitor operations and report maintenance problems after construction was completed.

The World Health Organization (1986) emphasizes that monitoring systems must be developed at the national, regional and local levels in order to assure the sustainability and efficient use of water systems. WHO contends that a monitoring programme can improve the process of water system planning, integrate water supply and sanitation activities into national development programmes, verify progress toward water service targets, and influence resource allocation. Information collected from monitoring and evaluation systems can be used to detect and reappraise high-cost water supply systems. It can be used as well to assess community benefits and to disseminate experience to government officials, community organizations and international assistance organizations.

The Ministry of Works and Supplies in Malawi is able to maintain the extensive water system in that country because of its well-developed programme of monitoring and evaluation. Monitoring assistants in the Rural Water Section of the Ministry carry out a planned annual programme of field visits and inspections and keep records for regional headquarter information systems. Day-to-day monitoring and small repair and maintenance tasks are carried out by village repair teams composed of volunteers from the local community. Community repair teams are supported by the Ministry for more complex repairs and system maintenance (Warner *et al.* 1986). The South Coast Handpump Project in Kwale, Kenya, succeeded because participating organizations adopted an explicit philosophy 'of every staff member being an evaluator'. Internal monitoring and evaluation of technology and community organization procedures played a crucial role. A learning approach to implementation was effective because among project officials 'need for change was not viewed as a sign of failure', as one observer noted. 'Change is inevitable in programs whose success depends on achieving a fit between different components and a fit to people's needs. Change was based on learning from experience' (Narayan-Parker, 1988, p. 26).

Continuous monitoring and evaluation are necessary because community-managed water systems must be designed and implemented using an adaptive learning process. User association members, government officials and international donors must develop flexible and adaptive procedures for monitoring performance and evaluating results (Rondinelli, 1983).

The importance of each of these factors differs among countries and among regions within countries, but evaluations of water supply projects indicate that the absence of any of the factors can weaken community management.

CONCLUSIONS

Although experience with extending water supply in developing countries during the 1970s and 1980s indicates that community management can contribute to improving the efficiency, effectiveness and sustainability of water supply projects, the capacity for community management is not well developed in all villages and towns. Capacity for community management is often weak in countries that do not have a strong tradition of community self-help. Nor does community management capacity always emerge spontaneously when water systems are extended, especially if the community is not consulted during design and planning, and if technology is unreliable and costs are high.

Studies of successful projects indicate that plans for developing community management capacity must be made deliberately, carefully and early in the design of water supply projects. Governments and international assistance organizations must be seriously committed to community management. Appropriate and adequate technical and material resources must be provided to users groups and community management associations during and after the construction of water supply systems.

Experience with rural and peri-urban water supply projects in developing countries suggests that the six major factors described earlier—incentives, skills and resources, appropriate processes, interorganizational relationships, appropriate technology, and monitoring and evaluation systems—reinforce each other in creating conditions conducive to effective community management. Programmes and projects designed to promote community management must give careful attention to each of these factors and the relationships between them.

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