

T E C H N I C A L R E P O R T

THE SUSTAINABILITY OF DONOR-ASSISTED RURAL WATER SUPPLY PROJECTS

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April 1994

**WATER AND
SANITATION for
HEALTH
PROJECT**

Sponsored by the U.S. Agency for International Development
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Prepared for the Bureau for Global Programs,
Field Support, and Research,
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by

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and
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ACRONYMS

CIDA	Canadian International Development Agency
DAC	Development Assistance Committee (USAID)
IRC	International Reference Centre
NGO	nongovernmental organization
OECD	Organization for Economic Co-operation and Development
ODA	Overseas Development Administration (UK)
O&M	operations and maintenance
PROWESS	Promotion of the Role of Women in Water and Environmental Sanitation Services (UNDP program)
USAID	U.S. Agency for International Development
USDA	U.S. Department of Agriculture
UNDP	United Nations Development Programme
WASH	Water and Sanitation for Health Project
WHO	World Health Organization
WS&S	water supply and sanitation

EXECUTIVE SUMMARY

This study focuses on the maintenance of benefits from donor-assisted, community-based rural water supply projects. In spite of general agreement that sustainability of improvements in quality of life and valued benefits should be the goal of development assistance, there continue to be many projects undertaken by international development organizations which fail to sustain benefits. Over the past 13 years, the Water and Sanitation for Health Project (WASH) has evaluated many projects and found that far too many lack the critical ingredients for sustainability. The definition of sustainability used in this paper is as follows:

A sustainable water supply and sanitation project maintains, or expands, a flow of benefits at a specified level for a long period after external funding has been withdrawn.

Few projects have yet been undertaken in the rural water supply and sanitation (WS&S) sector of developing countries that have successfully achieved full sustainability according to the definition above. From this definition, projects may be categorized into four classes, with classes I and II (and in some cases, class III) representing sustainability:

Class I

Benefits exceed end-of-project levels because of replication or expansion of the WS&S systems to beneficiaries beyond the target population. This ideal is rarely achieved.

Class II

Benefits continue for the original target group at about end-of-project levels. A lack of funds or other resources prevents further expansion to new beneficiaries.

Class III

Benefits drop down to a stable level somewhat below the end-of-project status. When WS&S facilities are placed in diverse communities there are typically a range of capabilities involved, from very limited to reasonably skilled. The least-skilled communities are marginal prospects, and some fail to manage their systems properly. Class III may be termed sustainable as long as benefits continue at an acceptable level.

Class IV

Benefits drop below an acceptable level and continue to decline, eventually disappearing entirely. Such projects have not been sustained and are termed failures.

To be called sustainable, projects do not have to recover all costs so that all the resources for replacement and maintenance or new investments are raised internally. We do, however, require that the WS&S sector be able to sustain the flow of capital subsidies for replacement and subsidy of other support costs. In practice, this may require major changes in both sectoral and macroeconomic performance, to improve cost recovery and self-reliance. In many

countries, the water sector is largely financed from general taxation while the country itself depends on unsustainable flows of foreign aid/loans. There is a danger that the projects judged to be sustainable are merely those popular enough to attract sustained financial support.

Projects are intended to produce benefits which continue at some specified level over time. "Post-project" assessments of sustainability take place after the project is completed to allow the local institutions time to become self-reliant. Assessments should be carried out several years after the end of the project construction period to allow a valid judgment as to the direction of the benefit stream and an assessment of sustainability. For donor-assisted projects the cessation of direct donor assistance will usually coincide with completion of construction or shortly thereafter. The critical event for evaluating sustainability is the removal of donors from financial, operational, and management support roles.

The case studies in Lesotho and Indonesia were studies in contrasts. In Lesotho, a centralized project was managed by a government agency in a small country with access to significant regional markets. In Indonesia, an NGO (CARE) project relied on community management in villages that were often far removed from government agencies and infrastructure. Project benefits in both countries were found to be sustained on a class III level, and several factors were identified as being important to achieving sustainability.

Many projects have been found by WASH and others to be partially successful, sufficiently so to provide important benefits, but none, in the view of the authors, have maximized the full potential of the sector. To help achieve this potential, guidelines for achieving sustainability are offered in this report, some of which are summarized below.

Identify and assess the project beneficiaries

Who will benefit by the project? A thorough understanding of beneficiaries and their motivation for participation is critical to success.

Involve the beneficiaries and other stakeholders in the project design

Community leaders, national and regional agency officials, and representatives of the private sector should be brought together to assist with the design as the key stakeholders in the project. Beneficiaries should be viewed as consumers with demands so that their needs are directly addressed in the design.

Review community management resources

Wherever possible, existing community structures should be used and strengthened. Rural communities are likely to be deficient in key skills. The local community, as the principal beneficiary, should be drawn upon and empowered to manage the completed project. Continuing access to financial and management resources is critical.

Select appropriate technologies

Technologies must be chosen with due consideration for the management system that will oversee the operation, maintenance, repair, and financing of a system.

Develop a reliable O&M system

O&M management models range from highly centralized ones through those with shared responsibilities to those that give the community complete autonomy. Each model has its merits depending on the local circumstances.

Ensure financial viability of ongoing operations

Financial viability depends on the beneficiaries' willingness to pay. This is conditioned by whether they have the means, whether they believe the service will benefit them personally, and whether they perceive that its costs are reasonable and equitably distributed. Full life cycle accounting is required to determine costs accurately and thus establish a cost/revenue stream that will avoid unanticipated deficits. Although sustainability may be compatible with continued financial subsidies, true cost recovery (including replacement) is a desirable goal.

Recognize the developmental limits of the natural resource base

It should be apparent that benefits of a WS&S project can be sustained only if the water resources are sustained. Each watershed has inherent physical limits to water resource development. The water yield of a particular watershed and its absorptive capacity to neutralize wastes now and for future generations may be limited. Environmental assessments are needed to identify potential impacts and recommend mitigation measures that can be designed into the project.

Continual analysis and a flexibility to adopt new approaches

The theme that should be stressed is the need for a philosophy of assistance in the sector, moving from a focus on narrowly defined service-delivery outputs to concern with sustainability. This requires an unwavering, long-term commitment to building indigenous institutions and an evaluation framework which place sustainability as the critical indicator of project success.

1

INTRODUCTION

1.1 Background

Although the term "development" has always implied sustainability, it is only in the last few years that sustainability itself has come to the forefront of development thinking. More than two decades ago, Bumgardner et al. (1971) stressed the importance of building institutions to support, strengthen, and perpetuate technological innovation. More recently, in an internal survey of donor experience, the USAID Development Assistance Committee (USAID 1988; OECD 1989) described sustainability as the "ultimate test of development efforts." In its review of ten years' experience, *Lessons Learned*, the Water and Sanitation for Health (WASH) Project (1990) viewed sustainability as "the basic measure of success of both the national system for development and the community systems." Thus, sustainability in water supply and sanitation (WS&S) is now a dominant concern, affecting decisions and actions that "may shape donor policies for years to come" (Bossert 1990).

In spite of the agreement that sustainability should be the goal of development assistance, there continue to be many projects undertaken by USAID and other international donors which most people would agree are unsustainable.

1.2 Purpose of the Study and Audience

This study is written for two broad categories of people involved with donor-assisted WS&S projects. It is written for designers and managers of WS&S projects to improve planning and implementation toward the goal of sustaining project benefits. Secondly, it can be used by evaluators as a checklist of possible explanations of level of sustainability. Although aspects of this study apply equally well to urban and peri-urban areas, the study concentrates on community-based WS&S projects in rural areas, designed to improve health. While some projects have sanitation components, this study focuses on water supply issues.

1.3 Structure of the Study

The main body of the report presents a review of some of the literature and defines sustainability (Chapter 2); discusses the factors affecting sustainability (Chapter 3); discusses how sustainability is measured (Chapter 4); and ends with conclusions and recommendations (Chapter 5). In the two appendixes, the guidelines are applied to projects in Lesotho and Indonesia.

Appendix A and B contain two case studies, from Lesotho and Indonesia, which were carried out by WASH as part of the sustainability study. These case studies were used in building the

conclusions and recommendations and were chosen because they represent two distinct approaches to development in the water and sanitation sector.

The Lesotho case is an example of a large USAID-funded project which had considerable success in providing water supply services to a large segment of the rural population in the country. The project ended in 1989, allowing ample time to pass for a post-project assessment of the local institutions and their role in sustaining project benefits. Much emphasis was placed on improving the institutional capacity of the government agency responsible for rural water supplies.

The Indonesia case, in contrast, is an example of an endeavor managed by a nongovernmental organization (CARE), using USAID and other funds, which covered widely dispersed areas of the country in a series of projects over the past 15 years. Most of the communities involved had little subsequent contact with CARE or the water agencies of the government of Indonesia after their particular project was completed. CARE did not attempt to build government agency capacity nor contribute to policy dialogue. Rather they emphasized the role of the communities, as institutions, in managing their own facilities.

Both field visits were undertaken by Jonathan Hodgkin, one of the authors of this report. Work in Lesotho was carried out from May 12 to 31, 1993, and in Indonesia from July 18 to September 18, 1993. Detailed notes on the community field visits are available from the WASH Project, as Working Paper No. 113.

2

SUSTAINABILITY DEFINED

2.1 Concept of Sustainability

Perhaps the most popular definition of sustainability is drawn from the 1987 report of the U.N. World Commission on Environment and Development (also known as the Bruntland Commission) which defined it as “meeting the needs of the present without compromising the ability of future generations to meet their own needs.” The concept of sustainability is used in many contexts and with widely different meanings. Some popular applications of the concept of sustainability are listed below.

- Global sustainability
- Sustainability of the environment
- Sustainable agriculture
- Economic sustainability
- Sustainable development
- Sustainable benefits
- Sustainability of water and sanitation project benefits

Global sustainability refers to factors of worldwide importance such as the shrinking ozone layer, nuclear proliferation, and high population growth. Environmental sustainability is applied to the functioning of plant and animal ecosystems, including human ones. Agricultural sustainability refers to maintaining crop yields from various farming operations without harming soils. For the purposes of this report, we will focus on sustainable development, sustainable benefits, and the sustainability of individual water supply and sanitation project benefits. Note that semantically it is the benefits that should be sustained—not the donor-assisted projects!

“Sustainable” means to endure, to last, and to keep in being. Sustainable development is about marshalling resources to ensure that some measure of human well-being is sustained over time. According to Pearce and Atkinson (1993), the objective is to take actions which will not impair future generations from living at least as well as the present and hopefully better. To do this, each generation must leave the next generation a stock of capital no smaller than the present one. Three forms of capital are recognized—natural, infrastructure, and human. Natural capital includes natural resources such as water, soils, forests, wildlife, and oil. Infrastructure includes machines, roads, dams, and cities. Human capital encompasses the stock of knowledge and skills exhibited by citizens. Together the various forms of capital comprise the aggregate capital stock of a nation.

WS&S projects utilize all three forms of capital. The role of the project is to: (1) utilize water (natural capital) for healthful purposes (and to avoid contamination of natural resources through sanitation initiatives); (2) build water supply facilities (infrastructure capital) which pipe the water to convenient locations for use; and (3) operate and maintain the facilities through skillful management of human and financial capital. Each form of capital must endure in order to achieve sustainability.

The phrase "sustainable development" is typically applied in terms of a project which is designed to achieve a particular goal or set of objectives in the context of progressive change. Projects in the rural water supply and sanitation sector are implemented by administrative entities serving a collection of village/hamlet sites with WS&S systems. "Sustainability" of the "project" is dependent on the performance of institutions. Project sustainability is indicated by the ability to continue to meet objectives defined in terms of benefit levels. Projects produce specific benefits for targeted beneficiaries which ideally should continue to increase after project completion. More narrowly, one can speak of sustaining or keeping in operation a particular WS&S facility, such as a sewer system or handpump.

2.2 Sustainability Defined

Sustainability, by our definition, is the ability of a project to initiate a process by which benefits are maintained. The word "project" is used in different ways by different stakeholders. In some circumstances, it is viewed as a temporary administrative arrangement, a budget, the physical infrastructure, a period of time, and even as some combination of all four.

Sustainability cannot be objectively quantified as it requires value judgments to actually apply the concept to specific projects and to come to conclusions as to whether or not the projects will supply sustainable benefits. Two fundamental problems arise:

- (1) The measure of benefit is often imprecise—the benefit intent of a project may cover multiple goals. Though a level of service may be maintained, that service itself has several dimensions of benefit, such as quantity, access, reliability, quality, and cost (QARQC).
- (2) The adjective "sustainable" has strong normative connotations. Different participants in the projects (donors, host government, beneficiaries) will have different evaluations of sustainability based on the relative value of achieving the various goals.

Benefit levels may be expressed in many ways. One frequently used measure is improved health, as indicated by a reduction in child mortality and morbidity from diarrheal diseases. Or it may simply be stated as the number of people who have improved access to potable water and sanitation systems. In any case, benefit level implies a threshold value whereby goals are said to be achieved and consequently a project is pronounced sustainable. However, if one accepts that there are degrees of sustainability, then one must abandon the distinction of "have they"/"have they not" achieved all goals, and allow for tradeoffs among different goals. One

would need an explicit preference function for the decision-maker to use. This implies a welfare function which would aggregate the different benefits by assigning relative value to the achievement of different goals. Even then, the concept of sustainability would require a time dimension.

An operational definition which permits some degree of ordinal ranking by sustainability will have to be narrow and specific. For instance, in a study of three African countries, Bossert (1989) defined sustainability in terms of outcomes persisting at least two years after project termination; and in a comparative study of five countries in Africa and Central America (1990), he defined it as outcomes at least three years after project termination (meaning completion of construction). Honadle and VanSant (1985), in a study of sustainability of integrated rural development projects, defined it in terms of "the percentage of project-initiated goods and services that is still delivered and maintained five years past the termination of donor resources." This latter definition appears empirically verifiable but in practice will be complicated by multiple outputs and lack of agreement about the verification of "delivery" and "maintenance."

Some definitions consider as a criterion of sustainability that the beneficiaries cover all costs after donor assistance has ended. This is a rigorous criterion that seldom applies even in developed countries, and it is appropriate that the DAC modified it to mean that a project could be considered sustainable even though some external support is provided, i.e., the capacity to implement a program or facility exists and the beneficiaries are self-reliant (but not necessarily self-sufficient). Resources could also come from transfers from other parts of the WS&S sector or intersectoral allocations. We have not attempted to address the issue of sector sustainability—only projects.

In summary, sustainability is the ability of a WS&S development project to maintain or expand a flow of benefits at a specified level for a long period after project inputs have ceased. In the narrowest meaning, the project is the physical infrastructure established and maintained/operated by the participating institutions.

2.3 An Ordinal Ranking of Projects According to Benefits Sustained

Projects follow a regular cycle of activities: planning and design, start-up, implementation, phaseout, and finally, project completion (Roark et al. 1993). Project benefits, such as reductions in child mortality through the introduction of WS&S systems and hygiene education to rural villages in a targeted area, gradually accrue after project start-up and grow at a faster rate until phaseout activities begin and ultimately external assistance (donors and projects) ceases. There can be some ambiguity in the term "post-project" as a project management entity, comprising staff from more than one institution, may be maintained after construction is completed. Donor assistance may continue after construction is completed or cease before the infrastructure is completed. In the case of donor-assisted rural water supply projects, the cessation of donor assistance is the milestone defining pre- and post-project boundaries.

The following ranking of projects by "sustainability" is a loose framework for evaluating the degree of sustainability. Its use depends on making value judgments as well as collecting data in conditions of poor and incomplete information.

Class I

Benefits exceed end-of-project levels because of replication or expansion of the WS&S systems to beneficiaries beyond the target population. This ideal is rarely achieved.

Class II

Benefits continue for the original target group at about end-of-project levels. Lack of funds or other resources prevents further expansion to new beneficiaries.

Class III

Benefits drop down to a stable level somewhat below the end-of-project status. When WS&S facilities are placed in diverse communities there are typically a range of capabilities involved from very limited to reasonably skilled. The least-skilled communities are marginal prospects, and some fail to manage their systems properly. Class III may be termed sustainable as long as benefits continue at an acceptable level.

Class IV

Benefits drop below an acceptable level and continue to decline, eventually disappearing entirely. Such projects have not been sustained and are termed failures.

The project cycle produces benefits which continue at some level over time. Post-project assessments of sustainability take place after a project is completed to allow the local institutions time to become self-reliant. Assessments should be carried out several years after the end of the project for a valid judgment as to the direction of the benefit stream and an assessment of sustainability. Benefits are expected to continue for a long period of time. For example, health benefits, which depend on the supply of clean water, could parallel the life of the system's pipes and pumps, perhaps 20 years. Health benefits could be extended if worn out equipment were replaced. Refresher training programs would also reinforce health behavior training in a project and solidify changes in user behavior, thus sustaining benefits.

In summary, sustainability has been defined as the maintenance over time of WS&S project benefits. As long as resources can be obtained to operate, maintain, and replace the systems (from whatever source), there are sustainable benefits. Projects are implemented by various institutions or organizations. Sustainability is the ability of the project, through the efforts of institutions, to maintain a level of benefits to a static or expanding population after donor assistance has ceased. A ranking system of four classes further refines the descriptive power of "sustainability" by defining criteria for an ordinal ranking of projects by sustainability. The next section examines the factors that influence the degree of sustainability achieved by donor-assisted rural WS&S projects.

3

FACTORS INFLUENCING SUSTAINABILITY

The following factors effect the sustainability of donor-assisted rural water supply projects:

- Institutions
- Development processes
- Technologies
- Contextual factors and forces
- Project organization and process
- Donors

3.1 Institutions

Institutions include the national and regional WS&S agencies, community organizations, and private-sector entities. These institutions, acting in various combinations, are the primary influences affecting sustainability. Two other institutions, donors and "projects," are a part of the institutional picture, but because they are not ongoing and indigenous, they are addressed separately in this report. (See Sections 3.5 and 3.6.)

3.1.1 National Agencies

National agencies concerned with the WS&S sector are generally the Ministry of Water and the Ministry of Health, or perhaps a partnership of the two. The role of national agencies is to provide leadership, policy, and direction to the sector. Strong leadership is needed to emphasize the essential role that WS&S plays in the welfare of the country and to promote support for the sector in the executive and legislative branches of government.

A clear policy is needed which addresses key issues confronting the sector. Issues including service levels, billing rates, management responsibility, technologies, private-sector roles, and O&M procedures must be spelled out to provide guidance and uniformity. Effective management of the various activities and processes carried out by national agencies is of obvious importance. For example, providing regulatory direction and logistical assistance for importing spare parts is crucial for continued operation of WS&S equipment. An adequate staff and operating budget are required.

Coordination is essential when ministries have overlapping responsibilities, a common occurrence in the WS&S sector. Coordination can be achieved by giving one ministry overriding authority, or by establishing an inter-ministerial council to resolve differences over policy and management.

3.1.2 Regional Agencies

Regional agencies are separated in this report from national-level agencies because many of their roles are significantly different. With increasing emphasis on decentralization, regional agencies are being given greater responsibility. Since they are closer and more accessible to the populations to be served, regional agencies are able to devise work plans that better address the realities of the local situation.

An important link at the regional level is the extension agent, who relays information from the beneficiaries about their needs and to the beneficiaries about what the government can do for them. The agent also acts as a trainer who reinforces messages related to hygiene, and as a monitor who watches out for problems that need attention. To function effectively, the agent, whose importance for sustainability cannot be overstated, must be provided with transportation and educational materials.

3.1.3 Community Organizations

Community organizations are gaining increasing importance because it is generally recognized that they know most about community needs and capacities and that governments can do only so much to extend services to all citizens. Community organizations may not fit the classic definition of "institutions" but are, nonetheless, treated as such in this study since they display the following institutional characteristics:

- operate under a set of rules, either formal or informal,
- have a mandate to carry out a specified range of activities,
- represent an identifiable population, and
- control certain resources to carry out activities.

Community management responsibility in the WS&S sector ranges from total control to passive acceptance of government services (Roark et al. 1993). Communities are often asked to assist in construction and O&M but, more and more, they are being given responsibility for the design, management, and financing of their systems even to the point of total ownership. Under these circumstances they are extremely important in determining sustainability. While financial sustainability in terms of covering capital as well as O&M costs through user charges is a desirable objective, a system may still be considered sustainable if financial subsidies from outside the project are maintained. This may be a reasonable assessment in circumstances where a high political premium is placed on the welfare of the project beneficiaries. It is in this

sense that water supply and sanitation systems are sustainable in the United States, even though there are substantial grants and concessionary financial facilities supplied by state and local government. Similarly, no one would deny that services in Singapore and Korea are sustainable even though user charges do not cover costs.

3.1.4 Private Sector Entities

Private-sector entities in WS&S include profit-making organizations and local nongovernmental organizations (NGOs). Profit-making organizations represent the commercial sector and are motivated almost exclusively by profit. They will provide services wherever needed as long as profits are assured. NGOs operate with more humanitarian motivations but nonetheless must carry out activities in a cost-effective way, to maintain their own financial solvency. They tend to carry out projects in marginal zones where government and the commercial sector do not operate.

The role of the private sector varies considerably in developing countries. Private firms may be hired for design, construction, maintenance, and/or repair. In rural areas, the private sector, apart from individual artisans, may be limited or nonexistent. The private sector is often a key player in the O&M process, providing repairs or spare parts, and therefore becomes critical to sustainability.

3.1.5 Institution-Building

The definition of sustainability indicates that institutional capacity is an essential condition for maintaining the flow of project benefits. Institutional strengthening includes attention to structure, policy, and staff training. WASH has found that institutional change needs to be promoted as beneficial to those affected, so that they will more readily understand why they are required to change the way they conduct their business (Edwards 1988). Several lessons regarding institutional development have been learned:

- Institutional development requires adaptability and flexibility to cope with polarized interests, delays, and frustrations;
- Most institutional change engenders resistance, and it is helpful for the change agent to know in advance who has a stake in maintaining the status quo;
- It is important not to take on too much at once, and wise to start with the least threatening change;
- It is important to work with all levels of the organization, recognizing that change in one part will have repercussions in others;
- Information is power in any organization. The change agent should set up a management information system that is accessible to all without restriction.

This work by Edwards, reinforced by Cullivan et al. (1988) in developing a methodology for diagnosing institutional deficiencies, provides a complete set of materials dealing with institutional development in the WS&S sector. WASH has prepared several studies that explain how sectoral organization can support or undermine the sustainability of project benefits. Edwards et al. (1992) presents eight lessons applicable to the rural sector:

- The pressure for greater efficiency and effectiveness is changing the role of government from provider of services to regulator and promoter.
- The diffusion of responsibility for rural water and sanitation among several government agencies has a negative impact on a project.
- A decentralized structure is more responsive to sectoral needs than a centralized structure since there is a higher degree of involvement by beneficiaries who have a stake in project outcomes.
- A decentralized structure must still perform the major sectoral tasks including defining policy, making long-range plans, setting standards, and carrying out research.
- The Ministry of Health should not be given full responsibility for rural water supply. However, it does have a role in providing hygiene education and possibly in constructing simple systems such as improved springs and shallow wells.
- There should be one body that addresses sector-wide concerns.
- Strong regulation at the central level is essential.
- It is not advisable to have a commercially disciplined urban utility manage a subsidized rural WS&S program.

3.2 Development Processes

Institutions utilize various development processes to influence, educate, and modify the behavior and attitudes of a targeted population. Such processes are used by all sectors, but each sector, including the WS&S sector, applies the processes in somewhat different ways (Yacoob and Roark 1990). Development processes are addressed here in the following categories—design, participation, health education, communication, financing, operations and maintenance, and monitoring and evaluation.

3.2.1 Design

Project designs and planning set the stage for all future activities. Designing with sustainability in mind is clearly an important factor. Designs should be produced with as much input from involved organizations as possible. This includes everyone who is expected to play a role in project implementation and operations. Input from beneficiaries and users is especially important but, unfortunately, is too often minimized because of the time and effort involved.

Project design begins with clearly stated goals, objectives, and underlying assumptions. Inputs, outputs, and organizational strategies must be detailed. Sustainability issues should be explicitly addressed and stated as developmental goals.

More specifically, there are several fundamental issues that must be addressed as part of the design effort. Assuming that a project is to target a region within a particular country for development assistance, this effort must be carried out first on a regional level by regional institutions and later at a local level by communities. A participatory approach (described in the following section) involving all relevant institutions should be utilized to resolve the following issues.

- Agreement must be reached on the nature of a problem (such as lack of potable water).
- There should be active review by participants of possible courses of action, especially by those affected by the problem.
- Choices must be made on the best or most feasible option (technological and/or non-technological approach) to solving the problem.
- Clarity should be achieved on the nature and magnitude of benefits to be received and who is to receive them.
- Agreement should be finalized on the responsibilities linked to receipt of the service and/or benefits and who shares these responsibilities.

Another important component of the design process is an environmental assessment. While WS&S projects are expected to improve the health of beneficiaries, they also have the potential for a negative effect on the physical environment. Water supply components must be carefully assessed to assure that the development of water sources is accomplished without compromising the sustained yield of the watershed. Similarly sanitation components must consider the treatment and disposal of wastes, both solid and liquid, to avoid contaminating the physical environment and impacting on dependent ecosystems, including human, animal, and plant species. Environmental assessments are needed to identify potential impacts and recommend mitigating measures that can be designed into the project.

3.2.2 Participation

Approaches used to achieve community participation are numerous and diverse in their objectives, operational strategies, and results. It is important to understand how different participatory strategies work and what they can be expected to accomplish from the perspective of both the beneficiaries and the extension agent. Four strategies are defined according to the extent of control which is assumed by the beneficiaries (Donnelly-Roark 1992).

Mobilization strategy. The project is planned and designed without consulting the beneficiaries, who are then mobilized to endorse and support it. Since full control remains in the hands of external agents, there is no real participation here, although this very common approach is taken with the mistaken belief that there is.

Community development strategy. Surveys or meetings are used to gain a better understanding of community opinions about a problem which has been identified by outside agencies as an obstacle to development. Beneficiaries are then invited to contribute parts to the design of the project and to share some responsibilities, but the external agents decide how much.

Organizing strategy. Local groups, without the help of an outside agent, organize themselves in cooperatives, unions, and community-based NGOs in response to a felt need. Beneficiaries then share control with representatives of these organizations.

Empowerment strategy. Community-based groups, perhaps assisted by an outside facilitator, initiate a learning/empowerment process that enables them to define their own goals, assess options, and assume responsibility for actions to achieve agreed on objectives. This strategy places control in the hands of the beneficiaries who claim their rights and responsibilities.

The question from a sustainability perspective is where control should reside. The mobilization strategy, leaving external agencies essentially in control, gives them responsibility for sustainability. The community development and organizing strategies, by sharing some control through negotiation, gives beneficiaries a say in sustainability. The empowerment strategy, by turning over full responsibility for the process to the beneficiaries, grants complete autonomy at the community level. A national policy that adopts the empowerment strategy and directs regional institutions to carry it out are key ingredients to sustainability.

Ultimately the question becomes, "How much autonomy is desirable at the community level?" The answer is that communities should be given (or take) as much autonomy as they can assimilate, but that no community can be totally self-sufficient. Each community must interact with certain other governmental bodies and often must rely on outside assistance to meet its needs. The best example is the community's need for spare parts to repair pumps. Usually these parts are imported and distributed through a network of businesses or agencies which must be organized and monitored by a national institution. A local community with a pump must have spare parts but cannot arrange this intricate network on its own. It can, however, decide if it wants a pump and accept the implications of this decision if community members have adequate experience and knowledge in this area. Local knowledge is often underestimated by outside agencies, but training in certain subjects is sometimes required.

3.2.3 Health Education

An understanding of health and hygiene is important in motivating people to behaviors which avoid environmental risks associated with poor sanitation. Beneficiaries must have a basic understanding of the cause and effect of disease and of hygienic practices which reduce or eliminate contact with disease-causing organisms. This knowledge helps to assure effective use of facilities and provides increased incentives to maintain the facilities.

A successful health education program should have these components (Pillsbury et al. 1988):

- A preliminary baseline survey of the community.
- Baseline studies of prevailing beliefs and practices related to water collection, storage, and use, to design hygiene education messages that will be heeded.
- Recruitment of local people as educators to ensure that sensitive subjects are treated correctly or appropriately (in the local context).
- Training that is lively, participatory, and task-oriented.
- Approval of community leaders to avoid misunderstanding of the intent or purpose of the program.
- A link between hygiene education and the construction of WS&S facilities so that the relationship is clear.

Frequently, too little attention is paid to health education in WS&S projects as construction activities consume the time and funds of both project and community members alike. WASH has found that if a small percentage of project funds is utilized for health education, then health benefits are significantly enhanced.

3.2.4 Communication

A communication network is needed to ensure that beneficiaries are kept informed on matters affecting the project. Information includes such diverse items as changes in government policies, updating on prices for equipment and materials, reinforcing health messages, cautions on epidemiological concerns such as cholera, and announcements of upcoming meetings. As indicated earlier, the extension agent is a critical link in two-way communication. The agent gives the community news about developments in the sector, reinforces messages on hygiene, receives information about how the community is functioning and whether it is satisfied with its WS&S system.

Educational messages via radio, television, and newspapers and social marketing techniques are effective methods for reaching large groups of people and providing timely information. Communication through the mass media is inexpensive but needs to be supplemented with sampling to ensure that messages are understood. The extension agent is the logical choice to carry out sampling and thus create a two-way information link.

3.2.5 Financing

The financing process, i.e., raising and maintaining adequate funds for WS&S facilities and activities, is clearly of critical importance to sustainability. Insufficient financing is a major factor in poor maintenance which, in turn, is often cited as a reason for project failure. The commitment of resources, particularly financial resources, by beneficiary communities is seen as an important indicator of the expected value of the project to these communities. Cost recovery contributes to sustainability not only through increasing resources available for sustaining and expanding benefits, but also by establishing relationships of accountability for resource use.

Financial questions are intimately bound to many other factors, including context and technology. Choices regarding interventions are, to some degree, dependent on physical characteristics within the project area, such as length of pipeline or depth of drilling needed to reach potable water sources. These choices, in turn, determine capital requirements and recurrent financing needs. Capital costs are equipment, labor, and material costs associated with initial project activities, including any and all construction activity. Recurrent costs are those associated with operation, maintenance, repair, and replacement of system components, and any ongoing health education or community extension activities related to the project. Where income levels are sufficiently high and/or continued subsidies are not assured, the depreciation and finance costs of repayment (principal and interest) or replacement (sinking fund) are also recurrent costs. All of these costs are largely dependent on technology choice, but project location, labor costs, and administrative costs also have an impact. Complete life cycle accounting methods should be used to ascertain the total costs involved. Such an approach will provide a solid understanding of the financial burden associated with technological choices and avoid surprises later in the operating life of the system.

It is obviously important that the beneficiary community have the capacity to generate the resources necessary to support the WS&S intervention. "In-kind" contributions can be valuable additions to a project, but cash is required for many items including equipment and fuel. Beneficiary contribution to capital costs, either labor or money, may be a significant indicator of system sustainability. Contributions are likely to indicate a sincere desire for the benefits which accrue from water supply and sanitation interventions. However, a willingness to contribute to capital expenditures, in cash or in-kind, does not of itself ensure sustainability.

The community's idea of the benefits it expects must be clearly ascertained. Some communities may not consider improved water quality important, placing greater value on access to increased volume of water or opportunities to profit from the sale of water to others. Communities must understand that they will be asked to bear the recurrent costs of services through user charges, household fees, or taxes imposed by a government agency or by a community management organization. It is important that anticipated recurrent cost levels be known to beneficiaries prior to their agreeing to take part in the project. In addition it should be understood that these recurrent costs are likely to increase as equipment ages and from inflationary pressures in the economy at large. In this regard it is important that a balance exist between a community's desire for WS&S services and its ability to pay for them.

Availability of funds for recurrent costs is often seen as a major factor influencing the sustainable operation of a WS&S intervention. Without adequate funding, proper operation and maintenance is not possible. The recurrent funding mechanism should provide a direct link between the source of funds and the provision of services.

Availability of credit from development banks or private sources may be a determining factor when major breakdowns occur or system components need replacing. Access to credit is a significant limiting factor for community organizations, and special arrangements with the banking sector may be needed. In cases where government agencies are responsible for operation and maintenance, they must be allocated the requisite funds. Too often, user fees are remitted to national headquarters or the national treasury, and allocations are not enough to cover expenses.

Community-managed operation and maintenance eliminates suspicions that agencies at the regional or national level might be exploiting the community and not providing the necessary support. It also places responsibility in the hands of those directly affected by service levels and any breakdowns that occur. However, community management is only as good as the funds to support it, and the sustainability of project benefits depends ultimately on the ability of the community to provide these funds.

In the current fiscal climate in many countries, it is unrealistic to assume the water sector as a whole can continue to attract subsidies justified for social reasons. Even in rural areas there is increasing support for the view that high existing water costs (pre-project) paid by consumers mean that willingness to pay is adequate to cover all the costs of simple systems. The key is to provide a range of options to match that demand. In the water sector as a whole, there is a move away from using infrastructure services provision as a means of redistributing income. Subsidies, although motivated for the best of reasons, often appear to inhibit the development of sound financial management practices and conservation of resources based on their economic value.

3.2.6 Operation and Maintenance (O&M)

The most obvious indicator of sustainability is the ongoing operation and maintenance of the system. O&M is an integrating process which draws on community participation, health education, financing, and management as well as the technical skills required to repair WS&S facilities. Systems which are successfully operated and maintained are, in fact, being sustained since all of the foregoing processes must be successfully in place for this to happen.

Studies of the sector often list O&M as the second biggest problem area after inadequate financing (WHO 1989). Both donors and country institutions give too little attention to O&M, preferring to believe that constructing new projects is more worthy of support than maintaining existing ones.

When systems are not maintained, most often the fault lies with poor O&M management rather than technical incompetence. While community-managed systems are increasingly being

promoted by donors and governments, there are, in fact, large variations among countries in the locus of responsibility. Varying degrees of control may be shown by communities, national agencies, regional agencies, and the private sector (Roark et al. 1993). Some countries see water supply and sanitation as a public good that only the state can provide. Others advocate communities taking on much of the burden of overextended government agencies. More typically, responsibility is divided among several or all of these institutions.

Where responsibility lies with community management there are five characteristics of success that have been identified (signified by the acronym, SARAR, used in UNDP publications) (Srinivasan 1990):

Self-esteem. The community and its leaders must be recognized and given credit for their creative and analytic skills in identifying and solving their own problems.

Associative strengths. People who bond together for a purpose become stronger and develop the capacity for joint action.

Resourcefulness. Each individual is an asset to the community and has some talent to contribute if called upon.

Action planning. The community, through its leaders, sits down to plan and then follows through with appropriate actions.

Responsibility. The community takes full responsibility for its decision and the consequences that result.

With the development of these five management characteristics, along with technical skills and financial solvency, communities should be fully capable of managing O&M successfully. In addition, there are several operational (and management) approaches that are recommended. Conservation of water resources should be adopted as a standard operational procedure to assure adequate supplies for present and future generations. Avoiding wastage by repairing leaks and prohibiting nonbeneficial uses of water have been found to have a significant effect in maintaining desired service levels. Reusing wastewater and biosolids for selected purposes is appropriate in many situations. Wastes should be treated in a manner that meets specific reuse opportunities. Rehabilitating facilities and equipment, rather than purchasing new equipment, is a sound approach. Adoption of such measures as operational policy will have a significant impact on sustainability.

3.2.7 Monitoring and Evaluation

The final development process, monitoring and evaluation, is particularly important to sustainability since it allows an ongoing review of project effectiveness. A key ingredient is to monitor factors specifically relating to sustainability and to establish checkpoints at appropriate intervals during and after project implementation.

Examples of indicators to be monitored would be verifying that communities are maintaining an adequate O&M fund or that a contract remains in force for the supply of spare parts to regional distribution centers in the project area. Such indicators must be established early in the project and used in monitoring activities to assure that actions are carried out when needed and to the degree necessary.

Monitoring and evaluation should be carried out with the participation of the beneficiaries, giving them the opportunity to decide on the criteria of success. Evaluations should be used as a management tool to identify any deficiencies and to establish a course of action to remedy problems. Ultimately, they steer the project toward the goal of sustainability.

3.3 Technologies

Technologies stand as a necessary link in the benefit flow picture and must be assessed differently from development processes. A technology will be sustainable to the extent that it is appropriate as judged by its suitability, responsiveness, acceptability, servicing needs, standards, and cost (OECD 1989).

Suitability. A technology must be able to provide adequate supplies of potable water and/or isolate waste materials from targeted beneficiaries if improving health is a project goal. Technologies must be chosen which provide an appropriate level of service for meeting consumer needs now and in the future. While this requirement appears self-evident, there are many examples of technologies which have been found successful in one setting but not in another. Handpumps are the prime example since their record of sustainability varies from highly successful to total failure and abandonment.

Responsiveness. The technology must be adaptable and durable, using readily available materials and permitting simple repairs and maintenance by local mechanics. Spare parts generally should be available from within the country to avoid expenditure of foreign exchange or lengthy delays in repairs. The technology should be able to function under less-than-ideal conditions and should not be replaced merely because a "new" or more sophisticated alternative appears.

Acceptability. The chosen technology must meet the community's social and cultural standards. Issues involving choices such as location of wells or standpipes, drilled wells or large diameter open wells, yard connections or house taps, and latrine or flush toilets are important considerations that must have serious community input.

The more complex the technology, the less reliable it is likely to prove. Users sometimes vent their frustration by tampering with the system, frequently bringing about harmful results. For example, if water purification equipment is bypassed to reduce system complexity, water quality is drastically reduced. When float valves in gravity systems are disabled, some users abruptly lose their water supply.

Service needs. Servicing requirements should be simple and inexpensive. This is an important consideration in technology selection at the time of project design. Overlooking servicing requirements is almost certain to invite the breakdown of the system.

Standards. Selecting standardized equipment that is used in other parts of the region or country or in other sectors (agriculture or industry) facilitates the procurement of spare parts and the services of mechanics when repairs are needed. Design standards help to assure that appropriate technologies are utilized to achieve a specified level of service.

Cost. There is a wide range of technologies in the WS&S sector, each with an associated cost. A drilled well equipped with a handpump, for example, can supply potable water for about \$15 per capita, while a household connection in a city costs about \$200 per capita.

Energy costs must also be weighed carefully. Even unpaid manual labor used for operating handpumps has an associated cost. Petroleum fuels are quite expensive in most developing countries. Renewable energies such as solar or wind power are attractive in some locations but generally are more expensive than more conventional alternatives.

The choice of technology affects people's willingness to pay as well as the prospect for workable O&M arrangements and for continued use of the system. It also reflects how carefully the needs assessment has been done before project planning. Full life-cycle accounting of the technology is needed to determine total costs and establish a cost/revenue stream that will avoid unanticipated deficits.

User satisfaction is the ultimate test for the choice of technology; for water supply systems, quantity, access, reliability, quality, and cost (QARQC) are the elements which determine users' satisfaction with the water supply system and their willingness to pay. Convenience, reliability, privacy, safety and cost are the comparable features for sanitation facilities. The technologies selected must fulfill these requirements.

WASH carried out a major study (McGowan and Hodgkin, 1992) on pump technologies for water supply purposes which discusses the complexity of the selection process. Balancing the technology with the institutional capacity to support the technology is a key ingredient to success.

3.4 Contextual Influences

Contextual influences are factors which are beyond the capacity of the institutions involved to change significantly. These factors must, however, at least be recognized and considered in project design, planning, and implementation. The extent to which they are taken into consideration, or neglected, affects how projects function and thereby the extent to which their work is sustainable. These factors can be classified as environmental, demographic, sociocultural, political, economic, and technological.

3.4.1 Environmental Factors

It is obvious that the benefits of a WS&S project can be sustained only if the water resources are sustained. Each watershed has inherent physical limits to water resource development. Planning should be based on the water yield of a particular watershed and its absorptive capacity to neutralize wastes. Unfortunately, rapidly growing populations are exceeding the local sources of supply in many locations throughout the world. Water sources that are found at some distance (or at great depths) from the users are becoming prohibitively expensive to develop. In locations where soils are shallow, oftentimes wastewater cannot be absorbed, leading to pollution of local water sources. Shallow groundwater supplies are being contaminated by chemicals from various industries, especially those related to agriculture.

Water sources should be developed so they do not exceed their regenerative capacity; otherwise a basic tenet of sustainability, providing for succeeding generations, is violated. Likewise, wastewater and associated biosolids must be treated and disposed of in a manner that does not degrade existing water and soil resources and their ability to support dependent life systems.

3.4.2 Demographic Factors

Demographic factors, such as population size, growth, and distribution, as well as health indicators like infant mortality and morbidity from water-related diseases, are crucial in project planning. Design standards may be influenced by population migrations, seasonal or permanent. The high rate of urban migration in many countries is a common example. WS&S projects often contribute to population movements by affecting the relative attraction of urban and rural areas.

3.4.3 Sociocultural Factors

Sociocultural factors include such diverse elements as ethnic and language differences, religious divisions, social stratification, intergroup relations, and the status of women. All these have a bearing on the shape and scope of a project and cannot be ignored.

Of particular note are cultural attitudes to the environment. Attitudes related to conservation and preservation of natural resources vary among societies. In some societies this is colored by consumerism stemming from expectations of improved living standards and fueled by commercial advertising. Economic growth is often viewed as a right to be achieved with little regard to negative effects on the natural resource base. Mass communications have created an almost universal awareness of the differences in living standards between countries, between regions, or between urban and rural populations. In some societies misuse of natural resources is driven by necessity, as there appear to be no other alternatives. Poor people are often unwilling to invest significant percentages of their income for connection to a sewer system, or even, for example, construction of a modern latrine. In other cases, indiscriminate

dumping of wastes is often viewed as an acceptable procedure by individuals because, they reason, others are doing it.

Respect for the environment requires a critical mass of supporters, regrettably lacking in many settings. In most cases WS&S projects will need to consider the environmental ethic of the population as a contextual factor and adapt to the conditions it imposes. It may be possible to influence this ethic if it is included as a project objective and approached as a developmental process in training and communication. However, such a major undertaking in social change is beyond the scope of most WS&S projects.

3.4.4 Political Factors

Political and economic conditions have been examined as factors in sustainability. The stability of the national government, the strength of government institutions at all levels, and the extent to which government services have reached all areas of the country are important (Bossert 1990). The commitment of the national government to the democratic process and decentralization makes a significant difference.

3.4.5 Economic Factors

The health of a country's economy is measured by such yardsticks as the growth rate, the rate of inflation, employment opportunities, income generation, and foreign exchange reserves. These have an indirect effect on sustainability of WS&S systems as on any economic activity. Of more direct significance for the WS&S sector is the history of donor support for development efforts, government policies for raising and allocating revenues, and the economic conditions in beneficiary communities.

3.4.6 Technological Factors

Apart from the issue of selecting an appropriate technology for a specific level of service as discussed in Section 3.3, it is also important to consider the overall technological context of an area. The technological context includes the types of technology envisioned for the project, the general level of mechanical skills available within the population, availability of equipment and spare parts, and training opportunities relevant to the technologies used. Effective technology transfer is considerably more complex than the installation of new equipment and a short training program for users or maintenance personnel. Within a country, region, and community, there is a generalized knowledge and understanding of technical issues which form the context in which technical change is introduced. This context will have implications for specific technical issues related to operation, maintenance, repair, and training.

Some of these factors clearly overlap. The availability of equipment, for example, is influenced by the strength of national economies. The sociocultural characteristics of a community will be determined in part by the physical environment of the region. Other factors, including political

conditions, economic stability, and weather patterns, over which the project has little or no control, can seriously impact the sustainability of project benefits. Although at the project level little, if anything, can be done to influence these factors, foresight and flexibility may mitigate changes which may otherwise spell an end to project benefits.

3.5 Project Organization and Process

In this section, "projects" are discussed as administrative and budgeting entities, where the project requires management in the context of a number of participating institutions. To this point in the discussion, attention has been focused on local institutions, development processes, technologies, and the contextual background that affects sustainability. All of these elements are a part of a country's permanent setting. These are factors that remain within the country as continued influences on sustainability. Indeed, their continued existence and permanency is what produces sustainability.

Projects, as temporary external entities, confer benefits whose continuity depends on the capacity of local and regional institutions to continue development processes that have been initiated and to apply skills that have been taught. Several factors influencing sustainability relate to the way that projects are carried out—preparations during planning and design, style and effectiveness of the operational approach, and monitoring and evaluation techniques that influence management decision-making. Management, advisors, shared decision-making, integration into national institutions, timing, image of success, and contractor continuity all play a part.

3.5.1 Management

Management stands out as a major skill area that determines whether a project succeeds or fails. In donor-assisted projects, the team leader is often an expatriate consultant, and his/her performance can make or mar the outcome. The team leader must be responsive to the contractor, donor, and host government, each with its own interests and agenda. Under conflicting pressures, the team leader and his local counterpart must be able to steer a course that leads the project towards the accomplishment of its objectives and somehow wins the cooperation of all.

This achievement requires more than technical competence (Bumgardner et al. 1971; Honadle and VanSant 1985; Edwards 1988). Bumgardner et al. have stated that the responsibility for the success of a project rests squarely on the performance of the team leader and counterpart project manager. Edwards, emphasizing the need to win acceptance (which in turn influences the effectiveness of the team), has blamed some of the problems affecting institutional development on the selection of long-term consultants purely for their technical background, not for their ability to transfer knowledge and skills. Honadle and VanSant have concluded that successful implementation of projects is invariably related to a "... manager's ability to recognize and use informal procedures, relationships, agreements, and communication

channels.... Behind-the-scenes relationships and maneuvers explain why things work or do not work. The ability to capture and guide informal dynamics characterizes outstanding managers." Rigid project designs, or emphasis on more visible results such as a certain number of facilities constructed, can make this difficult.

Similarly, experience of the WASH Project (WASH 1990) has demonstrated that coordination and collaboration in WS&S projects "...often depend more on professional networking and personal relationships than on institutional and contractual relationships." Honadle and VanSant (1985) have concluded that "...project designs should not trap implementors in rigid blueprints that eliminate opportunities to incorporate and evolve informal processes. Instead, a flexible and evolutionary approach is necessary." The ability to adapt to changing priorities is important. Things seldom turn out exactly as expected during the planning and design phases; the execution of a project often calls for modifications.

3.5.2 Advisors

Development literature gives project advisors more attention than almost any other factor affecting sustainability. Bumgardner et al. (1971) see advisors as "change models" who come with a fresh outlook unencumbered by an overwhelming knowledge of constraints. They are better able to see opportunities for improvement and are willing to try new ideas, bringing experience often not available in the host country. Thus, facilitation is one major function of the advisor. Others are strengthening leadership and skills (training), building self-confidence, and acting as a channel of information between counterpart institutions and the donor agency, a role that is particularly useful but easily compromised if institutional goals are sacrificed to service or facility objectives. The experience of the WASH Project (WASH 1990), confirms that "a participatory approach—facilitation not dictation—maximizes the chance for sustainable programs and projects." Other case studies bear out the importance of collaboration in project design and decision-making, and of respect and support for national priorities (Bossert 1989, 1990; Bumgardner et al. 1971; WASH 1990 and 1993; Yohalem and Hoadley 1990).

3.5.3 Shared Decision-making

Decision-making in project planning, design, and implementation can have a substantial impact on sustainability. Again, the WASH experience (WASH 1990) confirms that "whatever the level of decision-making, ordinary people can be trusted to solve their own problems if they are given the chance, and no policy or program is likely to succeed unless they are." Projects can encourage shared decision-making at every stage of the project cycle and at every level of administration by training participants for it.

If there is pressure to produce visible results, project staff may feel compelled to take over decision-making to the detriment of institutional development and the preservation of sustainability goals—squandering opportunities for national staff to learn and gain experience, ignoring national priorities and aspirations, and creating enduring resentments that impede the

realization of benefits. Resistance to shared decision-making need not be overt. It can be conveyed very subtly in the attitudes, sentiments, and non-verbal communications of advisors.

3.5.4 Integration Into National Institutions

The integration of projects into national institutions has been interpreted in several ways. A study of sector development and planning in Swaziland (Yohalem and Hoadley 1990) suggested that "sector development projects should be well integrated into the institutional structure of the sector, should contribute to its strength, and should support its programs." The importance of integration has been emphasized also by Bossert (1989, 1990) and Thompson (1990).

Integration can sometimes refer to vertical organizations established specifically for a donor project as opposed to counterpart institutions. These special units are staffed by drawing personnel from other units in related ministries or by outside recruitment. This arrangement may be attractive to the donor or contractor interested in rapid implementation but has several inherent disadvantages. Isolating the project and identifying it as an undertaking outside the purview of any existing organizational unit leaves it without an institutional home, without a sponsor in the organizational hierarchy, and without an owner when the project implementation period is complete. Quite often, personnel assigned to the implementation phase of the project are not accountable to supervisors in their parent units or ministries and, indeed, may find their positions have been filled in their absence. They may risk the loss of a secure job slot and may have no assurance that they will be given responsibilities where they can apply what they have learned on the project. Ultimately, they may have nothing to gain but experience that is not transferrable and some "perks" from working on the project. They may end up as part of a floating work force that moves from one donor-supported project to another.

Thus, a project that is set apart institutionally is unlikely to win the commitment of personnel assigned to it or to offer much benefit from the training it provides. Line agencies and ministries can be expected to dissociate themselves from it, and in the end, no matter how well it may be implemented, it may not be sustainable.

3.5.5 Timing

Timing is closely linked to the issue of flexibility as a project factor affecting sustainability. Bumgardner et al. (1971) emphasized, for example, the importance of having the technical advisor at hand to capitalize on the enthusiasm of national staff returning from participant training to help them get started right away. Case studies of sector development in Swaziland (Ntezinde et al. 1988a, b, 1989; Yohalem and Hoadley 1990) bear out the importance of readiness when activities begin. This may require delaying some preliminaries and speeding up others. The point is that timing should not be dictated by a rigid design schedule but should

allow for national staff to gain experience and an understanding of priorities, so that they participate as enthusiastic and well-informed partners in the enterprise.

3.5.6 Image of Success

When a project accomplishes what host country officials want and what communities have been promised, it wins respect and builds confidence, support, and a national constituency. Bossert (1989,1990) has observed that a reputation for success enhances the sustainability of a project. The staff becomes a resource whose potential value extends far beyond project boundaries. And if the donor is flexible and allows the diversion of resources, particularly technical resources, to meet an emergency or special need, the project earns a valuable dividend in public esteem that contributes to sustainability. Good communication of project activities and accomplishments is important for winning and maintaining the support of constituencies and beneficiaries, and for keeping implementing and funding agencies apprised of progress and obstacles.

3.5.7 Contractor Continuity

Projects generally are staffed and managed by long-term contractors from donor countries. Technical assistance emphasizing team planning, networking, strong home office support, good personal relationships with host country nationals, and continuity has been found effective (WASH 1990, 1993; Yohalem and Hoadley 1990). This approach can be strengthened by encouraging short-term collaboration with the staff of associated projects. Providing long-term staff for several year tours or, preferably, the life of the project obviously maintains continuity. Short-term assistance carried out by the same consultant in a series of steps is also effective. WASH support for projects has had its biggest impact when done serially over the life of the project.

3.6. Donors

Sustainability issues related to donors include control, collaboration, standardization, coordination, flexibility, comprehensiveness, and commitment.

3.6.1 Control

Therkildsen (1988), reviewing the involvement of five donor agencies in the water supply and sanitation sector in Tanzania, found that the approach in every case was control-oriented to some degree. Therkildsen identified five features of the control-oriented approach:

- The focus in medium- and long-term plans is construction targets.
- Detailed pre-implementation specifications spell out the means to reach these targets.

- Plans are based on the collection and analysis of substantial information prior to implementation.
- The plans specify the role of beneficiaries either as passive recipients of services or as participants in various predetermined activities.
- The technical assistance team bypasses the recipient organizations and maintains control at all times, especially during preparation of medium- and long-term plans but also, to some extent, during implementation.

Therkildsen concluded that control-oriented planning and implementation contribute significantly to the problems of donor-assisted sector activities. He observed that "the emphasis on plan documents and on visible results of donor-assisted activities that are typical of the control-oriented approach leads to excessive pressures for fast results...and makes it difficult to move beyond a welfare approach to development assistance."

The control-oriented approach implies that the donor's own agenda is of primary importance. Three WASH documents (WASH 1990 and 1993; Yohalem and Hoadley 1990) have pointed out how pervasive the influence of the control-oriented approach can be. The fact that this approach is discussed so frequently signifies that it is a factor to be reckoned with in any consideration of sustainability. The opposite approach is to emphasize empowerment strategies for local institutions as described in Section 3.2.2.

3.6.2 Collaboration

All too often, developing countries are anxious to get development assistance and may disregard aspects of the project with which they do not agree. Donors in these instances might be tempted to believe that they really know best and that the recipients or borrowers are greedy or even dishonest. This belief typifies the attitude of donors who historically have dictated terms based on their own preconceived notions of what is good. At best, it shows that some donors are oblivious to the extent of their influence. At worst, it is evidence of pure arrogance.

It is important to respect the position of the recipient and to remember two more points. First, to negotiate from a position of strength, the recipient or borrower should have established sectoral policy guidelines and plans. Secondly, even if the recipient is not quite clear about its own needs, the donor, despite experience in other countries that may be relevant, probably does not understand many of the subtle but significant influences that affect life in the recipient country. Together they can probably come to a better understanding than either of them alone.

Ignoring the position of the recipient will cause resentment, a disregard for the project, and even disassociation from the project because there is no sense of ownership. The result can be disastrous for sustainability. A recommendation based on experience in the WS&S sector in Swaziland (Yohalem and Hoadley 1990) suggests that "donor agencies should support a self-reliant national planning process and capability, aiming at establishing an institutional base

for planning and plan formulation responsive to nationally identified needs," and that "sector development projects should be well integrated into the institutional structure of the sector, should contribute to its strength, and should support its programs."

Donors can do much to integrate projects into existing national programs by building mutual confidence, looking at themselves as part of a collaborative team, viewing projects as vehicles that facilitate and support national programs, and avoiding plans that cannot be amended or adapted as they are implemented. Gow (1988) has pointed out that "as a means of building commitment, there is no substitute for dialogue in a process of joint donor/host government identification of programs, when this is seen as an exercise in which both sides listen, learn, and modify their approaches." This approach was successfully applied by USAID, project staff, government staff, and NGOs in Swaziland. As development proceeds, experience enlarges the national capacity for formulating sound policies and plans for future projects. Donors should permit as much autonomy as possible, even if plans do not meet the donor's expectations in every respect (WASH 1990, 1993).

3.6.3 Standardization

Differences in the standards and technologies of donor inputs can often cause difficulties which, if not resolved, hamper sustainability. If the host country is not strong enough to insist on standardization, which can be achieved by waivers that permit purchases of materials and equipment from sources other than the donor country, future maintenance problems are almost inevitable. Donors should adjust their requirements for use of their own manufactured equipment whenever local servicing of that equipment is in question.

3.6.4 Coordination

If donor inputs reinforce each other, they are more likely to be beneficial, provided they conform to a common (donor and national) concept of sector development. It is not easy to predict all requirements in the early stages of sector development, but agreement on a common strategy makes for the profitable use of experience. In Swaziland, for example, inputs from ODA, CIDA, and USAID to the water supply and sanitation sector were well coordinated, consistent, and complementary. Projects fully supported the national interest (Yohalem and Hoadley 1990), reinforcing WASH's conclusion (1990, 1993) that donors are most successful when they work together to support national plans.

Coordination among donors is necessary, and it should always be seen as an instrument to facilitate development assistance for the good of the host country. If it is interpreted as collusion among donors for some ulterior end or as a subtle infringement of national sovereignty, it could adversely affect sustainability.

3.6.5 Flexibility

The importance of flexibility and adaptability at all stages of the project cycle has been emphasized in a number of studies. A project in Thailand suffered from "a design that spelled out in detail what was to be done and when. This greatly hampered implementation. Blueprint designs are generally dysfunctional for institutional development projects. Instead, a flexible and evolutionary approach is necessary" (Finsterbusch 1990).

The willingness of donors to be flexible and responsive to needs, to accept national development goals and priorities, and to be ready for changes in timetables was stressed in a review of sector development in Swaziland (Ntezinde et al. 1989). A case study of sectoral planning and development in Swaziland (Yohalem and Hoadley 1990) recommended that "donor agencies should remain flexible and responsive to changing and emerging sectoral needs and priorities...and should be sensitive to the priority of sector development needs and to the timing of support activities. Programs or activities should not be forced but rather should be supported when the need is felt."

These examples reflect the general experience of the WASH Project (1990) that "it is important that the donor be flexible enough in its policies to permit needs to be addressed and opportunities to be seized in mid-stream." Thompson (1990) states that "uncertainty and flexibility should be designed into the project so activities and objectives can change as more information and on-site experience are gained."

3.6.6 Comprehensiveness

Development in the WS&S sector brings benefits that are multiplied when linked with health education, community development, primary health care/child survival, water resource development/irrigation, and environmental protection. Institutional development strengthens organizational structure, administrative skills, and operation and maintenance capacity.

In WASH Project experience (1990), "successful institutional development projects strive for comprehensiveness and wide participation [and] water supply and sanitation development proceeds most effectively when its various elements are linked at all levels." Yohalem and Hoadley (1990) stated that "donors should buy into sound sectoral development plans when designing projects, funding less visible elements that facilitate effective implementation and sustainability along with the more visible capital investment components."

3.6.7 Commitment

The commitment of all parties is important for the success and sustainability of any development project. The donor should have a genuine interest in sectoral development in the country and, because building capacity is a slow process, a commitment over a long period of time.

Case studies of sector development in Swaziland (Ntezinde et al. 1988a, b, 1989) have identified two distinct phases. The first phase requires the establishment of institutional capacity and a base of experience without which an understanding of the needs of sector development is difficult. The second phase includes planning, implementation, evaluation, feedback, and revision. The whole process can take nearly 10 years. Donor commitment provides continuity during the formative stage and allows the accomplishments of this period to take root (Ntezinde et al. 1989).

A review of sector development in Swaziland (Yohalem and Hoadley 1990) came to the recommendation that "donors should be willing to commit themselves to long-term support or to extend support of sectoral development to permit continuity and establishment of development initiatives." The experience of the WASH Project and the authors of this study confirms this and leads to the conclusion that "one of the most damaging mistakes by donors is refusing to make long-term financial commitments to countries in support of their water supply and sanitation activities" (WASH 1990).

4

EVALUATING SUSTAINABILITY

Many interrelated factors affect the benefit stream of a particular project. Given the many factors involved, the questions to be addressed now, are:

- How is sustainability to be measured?
- How can specific factors that contribute to sustainability (or lack of it) be identified?

As discussed in the definition of sustainability, certain criteria must be met:

- Benefits should flow at a desirable level.
- There must be requisite participating institutions to maintain the benefit stream.
- These institutions should have adequate resources.
- The benefit stream should continue for a sufficiently long period of time.

Presuming the project is a typical community-based WS&S project, it should have set out to improve health by providing

- a clean water supply and the safe disposal of wastes,
- education in hygienic practices, and
- institutional support for managing and maintaining the facilities and related health activities.

Based on worldwide evidence from WS&S projects, health benefits will accrue to individuals, especially those living in substandard environments, if their behaviors result in increased quantities of clean water being consumed and used for hygienic purposes and if they are protected from exposure to unsanitary wastes (Okun 1987 and Esrey et al. 1990). This presumption is necessary when, as is often the case for specific locations, there is insufficient data related to local health conditions.

4.1 Key Questions

To assess whether sustainability has been achieved in a particular project, several conditions must be met. The following key questions, to be posed several years after direct donor assistance has been completed, identify conditions which attest to sustained benefits from a project.

1. Are most of the people covered by the project using the facilities?

A usage level of at least 50 percent is considered acceptable. The use of water supply facilities will vary during the year, depending on the availability of alternative sources of supply. The 50 percent level is defined as the average for the year.

It is unrealistic for various reasons (social, financial, design) to expect the entire targeted population to be using the facilities. Some may find the water outlets inconveniently located or the taste of the water unpalatable. Others may object to latrine odors or the lack of privacy. High fees for services, long waiting lines for water, a pump too difficult for children to operate, and latrines that small children are afraid to use may also be reasons that dissuade them.

Appropriate technologies will provide the expected benefits when properly used, with some exceptions. For example, potable water can be contaminated by improper storage in the home. Although information on the effective use of the facilities is usually difficult to obtain, the presumption is that, if facilities are being used correctly, they are an aid to better health. Further, if hygiene education was stressed by the project, then health benefits are reasonably assured.

2. Are the facilities in operational order?

At least 75 percent of the WS&S systems should be in operational order at any given time.

The acceptable operational level is higher than the usage level because maintenance and repair depend upon standards that can be readily defined, whereas consumer behavior is less predictable. All mechanical systems will need occasional repairs and be out of commission for some period of time.

To be operational, a system requires the support of a qualified repair person, a supplier of spare parts, and adequate funds. The extent to which the facilities are used will influence the willingness to provide the funds. However, even enthusiastic demand and a readiness to pay cannot offset costs beyond the users' means or compensate for a lack of spare parts because of import restrictions.

3. Are management committees functioning?

At least 75 percent of management committees should be meeting periodically and carrying out agreed upon tasks.

The management committees should be carrying out their duties regarding O&M, accounting, monitoring, and evaluation. Their most important task is to provide overall leadership to maintain community support of the system and to ensure that funds for O&M are adequate. Some committees might expand their work into other sectors, such as agriculture or education, which should be seen as a strong indicator of their effectiveness.

4. Are extension agents meeting with committees regularly to facilitate ongoing activities?

Extension agents should meet with each committee at least twice a year to provide support for ongoing activities, to assist in solving community problems, and to provide information on new developments related to the sector. Ideally, they should continue to reinforce lessons about hygiene and the relation of WS&S to good health. A superior extension program is identified primarily by an ongoing program of activities and adequate transportation for the field agents.

5. Are trained repair persons and supplies of spare parts easily available?

Repair persons may come from the government or from the private sector. Government employees must have an adequate budget and reliable transportation. Private mechanics must have an assured market for their services and be paid an acceptable fee. Spare parts may be provided by either the government or private sector but must be located conveniently to the users.

6. Is a specific government agency effectively managing the WS&S sector?

A government agency must be unambiguously in charge of managing the sector and providing oversight of the project area. If several ministries are involved, coordination between them is essential. One agency and its staff should be recognized as having clear responsibility and be given an adequate budget.

7. Is there an importer or manufacturer of spare parts?

There must be at least one importer or manufacturer of spare parts. The importer may be either the government itself, a company under contract to the government, or an independent private company. There must also be a distribution system for spare parts.

8. Does each institution (community, regional agency, national agency) have adequate financial resources ?

Communities should have an established fund to cover O&M costs. Some communities may prefer to raise funds only when a breakdown occurs. This is acceptable if the community is certain it can get the money fairly quickly, but this practice is not recommended. Regional and national agencies should have adequate funds to employ the requisite number of extension agents and to equip them with the transportation and materials to carry out their work. In fact, if the responses to the first seven questions above are positive, then that is a sufficient indicator that adequate financial resources exist.

In summary, affirmative responses to the eight questions above would lead to a conclusion that the benefits provided by a specific project are being sustained. In reality, meeting the threshold values of questions 1 and 2 are the critical tests, since they tend to integrate factors in the remaining questions. Questions 3 through 8 identify factors and conditions that constitute an institutional capacity to use and repair the facilities.

4.2 Factors Affecting Sustainability

Judging whether a project and its benefits are sustainable is important as a means of determining project success. However, understanding what factors influence sustainability is even more important for designing better projects in the future.

Chapter 2 described the factors affecting project sustainability. The relative importance of institutions and the factors influencing them change over time.

In the project design phase, the key institutions are the national WS&S agency, the donor, and the community. The key development processes include design and participation.

In the project implementation phase, the key institutions are the regional agency, the donor, the private sector, the project management staff, and the community. The development processes include participation, construction, O&M, health education, financing, communication, and monitoring and evaluation. Technologies and their use become important in this phase.

In the post-project phase, during which time sustainability is measured, the key institutions are the national agency, the regional agency, the private sector, and the community. The external institutions, project staff and donor, are removed from the picture. The key development processes are participation, continued health education, O&M (including management), financing, monitoring, and communication. The proper use of technologies continues to be important.

Contextual factors, which are present in every phase, may alternatively grow or diminish in importance since they change over time. The relationship between institutions and the factors affecting them are complex and will doubtlessly vary between specific projects and countries.

4.3 Supplemental Questions for Assessment of Sustainability

Several additional questions can be used to identify and understand the relative importance of factors influencing sustainability. The questions relate to institutions, development processes, project, donors, and contexts. Wherever feasible, a threshold value is indicated. Because of the subjective nature of the issue, however, most of the questions are not measurable in a quantitative manner and can be addressed only in a general sense.

■ Institutions

□ National Agency

1. Do national agency actions have a long-term commitment to project goals?
2. Is there a national policy statement that clearly defines the respective responsibilities of the government, the community, and the private sector; financing mechanisms; equipment standardization; and arrangements for providing spare parts?

- **Regional Agencies**
 - 3. Do regional agencies have work plans for extension activities that include reinforcing health education messages and periodic (semiannual at least) monitoring of community activities?
- **Communities**
 - 4. Are community WS&S committees or key individuals confident of managing the WS&S facilities and related activities?
 - 5. Are users satisfied with the service provided and content to see no changes?
 - 6. Are more women serving on WS&S committees and participating in activities than before the project began?
- **Private Sector**
 - 7. Are trained mechanics available to maintain and repair the facilities?
 - 8. Is there an importer or manufacturer of spare parts and a system for distributing them?
- **Development Processes**
 - **Design**
 - 9. Did design documents spell out sustainability as an objective to be attained?
 - 10. Did communities provide substantive input into problem identification and project design?
 - 11. Was a baseline survey carried out to verify project assumptions and obtain information on knowledge, attitudes, and practices related to WS&S?
 - **Participation**
 - 12. Were communities given a voice and vote in all aspects of the project cycle?
 - 13. Do WS&S committees participate in O&M management and financial decisions?
 - **Health Education**
 - 14. Is there evidence of positive behaviors related to hygiene (such as proper storage of water, use of soap, and clean latrines)?
 - 15. Is there demonstrated knowledge of the causes of diarrhea and other water-related diseases and of ORS preparation?

- **Communication**
 - 16. Do communities receive information about WS&S through the media and/or extension agents?
 - 17. Do WS&S committees have adequate communication channels with government agencies and the private sector to express community needs?
- **O&M**
 - 18. Did the project design specify the responsibilities of the community, government agencies, and the private sector and describe the financing mechanisms for O&M?
 - 19. Are O&M roles clearly defined and understood by all responsible parties?
 - 20. Is the ownership of WS&S facilities clearly defined?
- **Financing**
 - 21. Do the responsible parties (communities or government agencies) have the resources to cover recurring O&M costs?
- **Monitoring**
 - 22. Has the project been monitored to verify that all benchmarks of progress, such as the items in this list, have been met? (The use of a baseline survey is an important tool in determining benchmarks.)
 - 23. Did communities take part in the evaluation design and the review of conclusions as a means of indicating whether they were satisfied with project benefits?
- **Technologies**
 - 24. Were selected technologies the most appropriate in terms of affordability, maintainability, and the level of service desired?
- **Project**
 - 25. Was the project managed within the existing institutional structure to facilitate continuation of activities after the completion of construction or was a special project organization created?
 - 26. Was at least 15 percent of pre-completion project resources spent on institution-building activities, including the training of trainers?
 - 27. Was there evidence of flexibility in adapting to problems related to sustainability during the course of implementation?

■ Donor

28. Has there been continuing donor interest in sustainability prior to and during project implementation and support for the transition to operational status?

■ Context

29. Have there been any contextual factors (e.g., droughts, high inflation rates, political upheavals, etc.) since the project was completed that have adversely affected the benefit stream?

4.4 Selection of Case Studies

In order to test the guidelines for measuring sustainability, case studies were carried out. In a search for projects for field-testing, USAID missions that had funded WS&S projects were asked to determine interest in a project sustainability assessment. The missions were assured that they would not be required to provide any support, and that although full post-project evaluations are not normally carried out, this would be an opportunity to gather information that would aid future project design and performance.

The criteria for selecting the projects were as follows:

- The project had been successful in meeting most of its objectives.
- Project construction had been completed for at least two years, with no further donor inputs.
- The project facilities and benefits were being overseen by local institutions at the community level and/or government agency level.

The missions were informed that the WASH assessment would involve

- meeting with community organizations and government agencies in the sector
- reviewing documents and reports related to the project and the sector, and
- accompanying knowledgeable extension agents on field visits to WS&S facilities to see whether hygiene practices had improved.

The search led to the selection of projects in two countries, Lesotho and Indonesia. Lesotho was selected primarily because of the USAID Mission's interest in assessing a sector in which it had not been involved in recent years. In the mid-1980's, the mission had launched a major effort to provide potable water to virtually all the rural areas of the country, and the effort was pronounced a success. WASH carried out a privatization study at the end of the project but little was known of its present status. While USAID's involvement in the WS&S sector has been terminated, other donors have since provided assistance.

Indonesia was selected because of CARE's interest in assessing WS&S projects it had carried out in several areas of the country some years earlier. CARE/Indonesia provided an

interesting example of a nongovernmental organization working in WS&S development. CARE and WASH shared the costs of the field study since CARE wanted the assessment to cover a much wider area than WASH originally envisioned.

Jonathan Hodgkin, a WASH consultant and co-author of this report, carried out both field assessments, spending two weeks in Lesotho and five weeks in Indonesia. A detailed description of the field assessments is attached in separate Appendix A and B.

4.5 Results of Case Studies

In both Lesotho and Indonesia, it was found that project benefits were continuing at a reduced but acceptable level (Class III) and therefore the projects were deemed successful in achieving sustainability. A summary of responses to "key questions" is provided in Table 1.

The negative responses in Table 1 are clear indicators of factors which, in hindsight, deserved more emphasis during project design and implementation to achieve the goal of sustainability.

It is apparent that the two case studies were markedly different and that the respective projects were carried out in very different ways. Lesotho is somewhat unique in Africa in several important aspects. The Lesotho project focused on improving the national water supply agency and was therefore highly centralized. It did not rely on community organizations in managing the systems although much emphasis was placed on community participation in construction. The communities looked to the national agency (or regional offices of the national agency) for repairs. Given the small size of Lesotho, however, a more centralized management approach was not a major disadvantage. Since 1989, when the USAID project was completed, more emphasis has since been placed by the water agency on community management and, if this continues, may turn out to be a very positive evolution. The proximity of Lesotho to South Africa and its relatively healthy economy is an advantage since it provides easily accessible spare parts and jobs which produce remittances for community use.

Indonesia is also unique in many ways and stands in stark contrast to Lesotho. The series of CARE projects were carried out with minimal contact with government agencies. Most of the communities involved are isolated and generally had not received government-provided services. CARE placed emphasis on establishing community self-reliance, and this approach was adopted by the communities. The choice of spring capping as the preferred technology and solid construction techniques have proven to be good approaches that have endured well and provide an acceptable level of service to the communities involved.

Some significant similarities are shared by the two projects. Neither country had a WS&S sector policy which adequately delineated a clear division of responsibilities among institutions. Financial resources were marginal at both the community level and the national government level. More emphasis on training would have been beneficial in both countries. Both projects faced problems in keeping handpumps operational, which underlines the need to choose simple technologies whenever communities must shoulder responsibility for maintenance.

In spite of the conclusion that the project benefits are being sustained in Lesotho, it is a fragile situation that has depended on external aid (primarily from the Swiss) to reinforce the institutions involved. The definition of sustainability allows for some dependence on external support as long as the major tasks are carried out by internal institutions. Lesotho arguably falls within these parameters, although barely so.

The "key questions" used in the case studies were generally found effective in drawing out important factors determining sustainability. The questionnaire was purposely limited in the number of questions in an attempt to identify the most important factors in an efficient manner. In future studies some modifications or additions to the questionnaire may be necessary to fit the specifics of the country and/or project involved and to identify and describe more subtle factors and issues.

Table 1
Responses to Questions for Measuring Sustainability

Question	Lesotho	Indonesia
Are at least 50% of the people covered by the project using the facilities?	Yes	Yes
Are at least 75% of the facilities in operational order?	Yes	Yes
1. Do national agency actions manifest a long term commitment to project goals?	Yes	Yes, partially
2. Is there a national policy statement that clearly defines the respective responsibilities of the government, the community, and the private sector; financing mechanisms; equipment standardization; arrangements for providing spare parts?	No, not entirely	No
3. Do regional agencies have work plans for extension activities that include reinforcing health education messages and periodic (semiannual at least) monitoring of community activities?	Yes, but health ed not included	No, CARE provides this
4. Are community WS&S committees or key individuals confident of managing the WS&S facilities and related activities?	No	Yes, for gravity system, no for handpumps
5. Are users satisfied with the service provided and content to see no changes?	Yes	Yes
6. Are more women serving on WS&S committees and participating in activities than before the project began?	Yes	No
7. Are trained mechanics available to maintain and repair the facilities?	Yes	Yes
8. Is there an importer or manufacturer of spare parts and a system for distributing them?	Yes, but handpumps lacking	Yes, except for Bandung pumps
9. Did design documents spell out sustainability as an objective to be attained?	No	Yes

Question	Lesotho	Indonesia
10. Did communities provide substantive input into problem identification and project design?	Yes	Yes
11. Was a baseline survey carried out to verify project assumptions and obtain information on knowledge, attitudes, and practices related to WS&S?	Yes, but belatedly	No
12. Were communities given a voice and vote in all aspects of the project cycle?	No, not adequately	Yes, and increasingly so for more recent activities
13. Do WS&S committees participate in O&M management and financial decisions?	Yes	Yes, partially
14. Is there evidence of positive behaviors related to hygiene (such as proper storage of water, use of soap, and clean latrines)?	Yes	No, not generally
15. Is there demonstrated knowledge of the causes of diarrhea and other water related diseases and of ORS preparation?	Yes	Yes, partial
16. Do communities receive information about WS&S through the media or extension agents?	Yes	No
17. Do WS&S committees have adequate communication channels with government agencies and the private sector to express community needs?	No, agents ineffective	Yes, in some cases
18. Did the project design specify the responsibilities of the community, government agencies, and the private sector and describe the financing mechanisms for O&M?	Yes, but inadequately	No, but info conveyed to communities
19. Are O&M roles clearly defined and understood by all responsible parties?	No	Yes
20. Is the ownership of WS&S facilities clearly defined?	No, policy and practice differ	Yes
21. Do the responsible parties (communities or government agencies) have the resources to cover recurring O&M costs?	No, not entirely	Yes, but fragile

Question	Lesotho	Indonesia
22. Has the project been monitored to verify that all benchmarks of progress, such as the items in this list, have been met? (The use of baseline survey is an important tool in determining benchmarks.)	Yes, partially	Yes
23. Did communities take part in the evaluation design and the review of conclusions as a means of indicating whether they were satisfied with project benefits?	No	No
24. Were selected technologies the most appropriate in terms of affordability, maintainability, and the level of service desired?	Yes, but handpumps have problems	Yes, for springs No, for handpumps
25. Was the project managed within the existing institutional structure to facilitate continuation of activities after it ended as opposed to creating a special project organization?	Yes	No
26. Was at least 15 percent of project resources spent on institution-building activities, including the training of trainers?	No, but training emphasized	No, probably not
27. Was there evidence of flexibility in adapting to problems related to sustainability during the course of implementation?	Yes, but very slow	Yes
28. Has there been continuing donor interest in sustainability prior to and during project implementation and support for the transition to post project status?	No, not sufficient	Yes, particularly as projects near completion
29. Have there been any contextual factors (e.g., droughts, high inflation rates, political upheavals, etc.) since the project was completed that have adversely affected the benefit stream?	No	No

CONCLUSION AND RECOMMENDATIONS

Over the past 13 years, WASH has evaluated many projects, including two for this study, and has found that far too many lack the critical ingredients for sustainability. From the authors' perspective, few projects have yet been undertaken in the WS&S sector of developing countries which have successfully achieved a recommended balance of providing water supply and sanitation services with health education and empowerment of local institutions to manage their systems on a sustainable basis. Many projects have been partially successful, sufficiently so to provide important benefits, but none have maximized the full potential of the sector.

What guidance, then, can be given to project designers and managers to improve this situation and assure that project benefits will be sustained? The following recommendations summarize some of the more important issues that must be addressed. They should be viewed as a set of measures that are interrelated and tend to overlap. They are not presented in order of importance nor as a linear sequence of steps but rather as a compendium of key factors. Specific settings will vary, and project officers must be discriminating in choosing among the factors.

1. Identify and assess the project beneficiaries or target population

Who will benefit by the project? A thorough understanding of beneficiaries and their motivation for participation is critical to success. The lack of adequate clean water and sanitation must be seen by beneficiaries as a problem, and the proposed intervention to solve the problem must be recognized as a viable solution. There will be other indirect beneficiaries, apart from the communities receiving WS&S services, such as repair persons, government agency staff, local politicians, to name a few, who must also be identified.

2. Understand the knowledge, attitudes, and practices of the target population

A KAP study should be undertaken during the design phase or at the beginning of the project. It will serve to refine the project design and provide a benchmark for future evaluations.

3. Involve the beneficiaries and other stakeholders in the project design

Community leaders, national and regional agency officials, and representatives of the private sector should be brought together to assist with the design as the key stakeholders in the project. Beneficiaries should be viewed as consumers with demands so that their needs are directly addressed in the design. Special attention should be paid to assuring that women leaders are part of the process and that their particular needs are included.

4. Ensure the commitment of national institutions to the project

Assess the political will of the pertinent institutions and solidify their commitment to the project goals. Review their capability and capacity to carry out necessary activities. Can they fulfill promised actions? Verify if there are any legal or policy constraints that are limiting to project objectives.

5. Review the resources of regional institutions

Regional institutions should have adequate numbers of trained extension agents equipped with the tools, materials, and transportation they need to function effectively. Extension agents provide the critical communication link with the beneficiaries and thus act as the linchpin of project success.

6. Review community management resources

Wherever possible, existing community structures should be used and strengthened. Rural communities are likely to be deficient in some key skills, and it is important to identify what these are.

7. Emphasize training to strengthen institutions at all levels

The training of key staff at all levels is essential because management skills are often in short supply. Training should employ adult education techniques, and the material should be presented in logical progression, rather than in single episodes, to facilitate retention. An in-house training capability within pertinent institutions should be considered as a project objective.

8. Establish interagency coordination

WS&S projects invariably involve several ministries, typically those concerned with public works, health, sanitation, rural development, urban infrastructure, and, increasingly, the environment. If there is no permanent interagency committee under a strong chairperson that meets regularly, a body answering that need should be established. Special project implementation units should be avoided. A roundtable consensus process should be adopted for decision-making, with equal weight given to social, economic, and environmental concerns.

9. Develop flexible workplans

Flexible workplans are a key ingredient in the success of a project. Planning workshops are essential to bring key stakeholders together at regular intervals to review progress and revise targets when necessary. Anticipatory solutions should be stressed rather than end-of-pipeline reactive approaches to problem-solving.

10. Recognize the role of the private sector

In many arenas, the private sector is more efficient than government agencies, and the services it offers should be used. Construction, drilling, repairs, and the supply and distribution of spare parts provide the most obvious opportunities. Are free-market mechanisms in force or are

there regulatory constraints acting against the private sector? In some countries it will be necessary to set aside certain project activities for private entrepreneurs to encourage their participation.

11. Select appropriate technologies

Technologies must be chosen with due consideration for the management system that will oversee the operation, maintenance, repair, and financing of a facility. This point should be obvious but is too often overlooked. Another critical element of technology choice is to assure energy efficiency. The range of power alternatives includes human, gravity, solar, wind, and fuels. Each has particular advantages and disadvantages that must be carefully weighed.

12. Develop a reliable O&M system

O&M management models range from highly centralized ones, to those with shared responsibilities, and those that give the community complete autonomy. Each model has merits depending on the circumstances. The important point is that the O&M system should be developed at the project design stage and should be firmly established early in the project implementation stage. It is critical that the chosen system have time to mature and face situations requiring independent problem-solving before the end of the project. The need for fine-tuning the system should be expected, with emphasis on repair and rehabilitation of facilities. Conservation strategies, such as controlling leaks in pipelines, will be needed to avoid loss of precious resources. Is there a written agreement that establishes specific responsibilities including who owns the facilities, undertakes repairs, supplies spare parts, provides hygiene training, and who must pay and how much? These issues are central to the O&M process (and sustainability) and must be clearly understood by all participants.

13. Foster open and extensive communication

Both the beneficiaries and those executing the project must be in constant communication about new developments and the changes they necessitate in project activities. The extension agent is an integral part of the communication process precisely because he or she both gives and receives messages. Mass communication through radio and other media also play a role in project support. Messages should be designed to address a wide audience so that all stakeholders are reached. Special attention should be paid to women, youth, the poor, and ethnic and religious minorities.

14. Ensure that beneficiaries are educated in all the benefits they will receive

Some benefits, such as the added convenience of having a piped water system in the home, will be readily apparent and valued. Others, such as a reduction in water-related disease, will not always be obvious to people with limited education. Hygiene education is essential for several reasons: to motivate people to adopt habits which avoid unhealthy practices, to assure that facilities are used in the most efficient manner, and to increase demand for WS&S services.

15. Ensure financial viability

Financial viability depends on the beneficiaries' willingness to pay. This is conditioned by whether they have the means, whether they believe the service will benefit them personally, and whether they perceive that its costs are reasonable and equitably distributed. Willingness to pay is complex and involves a strong psychological element which is sometimes difficult to judge. Asking beneficiaries to pay before services are begun is a recommended approach. It is necessary to establish the financial system early in the project to allow fine tuning. Full life-cycle accounting is required to determine costs over time and thus establish a cost/revenue stream that will avoid unanticipated deficits. Bookkeeping that is open to public scrutiny will develop community trust that funds are being collected and distributed equitably.

16. Devise an acceptable cost-sharing formula

Cost-sharing involves a delicate balance. There are differing views as to the role that government should play in financing WS&S services. Some governments see it as a required public service. Others recognize the frailty of governments with many conflicting demands on their services and recommend that services be determined by market demand on a pay-as-you-go basis. Typically there will be a sharing. Ideally, beneficiaries should be charged directly at least for the recurring costs of O&M. Capital and/or depreciation costs will often be the responsibility of the government. How much can government afford? Whatever the formula arrived at, it should be made clear to all stakeholders. Having donors pay a share of recurrent costs is not recommended.

17. Publicize project accomplishments to build support

Sustainability requires the continued support of all stakeholders. Briefing them periodically and showcasing project successes at opportune times is an important strategy. Identifying which stakeholders are critical for support after the project is completed and donor inputs are withdrawn is a necessary step.

18. Maintain an awareness of contextual factors

Although contextual factors are beyond institutional control, it is still necessary to maintain an awareness of them and plan responses. Unusual events such as droughts, high inflation rates, or political upheaval may not occur often, but they may be predictable in a specific setting. Contingency planning is only prudent.

19. Recognize the developmental limits of the natural resource base

It should be apparent that the benefits of a WS&S project can be sustained only if the water resources are sustained. Each watershed has inherent physical limits to water resource development. Recognition is needed of the water yield of a particular watershed and of its absorptive capacity to neutralize wastes now and for future generations. Environmental assessments are needed to identify potential impacts and recommend mitigation measures that can be designed into the project. Is there public support for environmental protection? Public education should be included in project objectives to enhance the environmental ethic of the

population. Policies should be aimed at placing more emphasis on water conservation, waste water and biosolids reuse, and on rehabilitating existing facilities and equipment in order to save limited resources.

Sustainability requires continued analysis and the flexibility to adopt new approaches. It would be unrealistic to expect sustainability without long-term commitment on the part of all participants: on the part of donors to technical and managerial training and health and hygiene education, of host country governments to fostering community development, and of local communities to assuming responsibility for the management and financial viability of their systems. The theme that should be stressed is the need for a philosophy of development assistance along with a shift in the water supply and sanitation sector from an earlier focus on narrowly defined service-delivery outputs to a concern with sustainability. This requires a long-term commitment to building indigenous institutions which identify sustainability as the critical determinant of project success.

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Appendix A

**USAID RURAL WATER SUPPLY AND SANITATION PROJECT
IN LESOTHO**

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ACRONYMS

DRDO	District Rural Development Officer
EEC	European Economic Commission
GOL	Government of Lesotho
HELVETAS	Swiss NGO
IDWSSD	International Drinking Water Supply and Sanitation Decade
KAP	knowledge, attitudes, and practices
Loti (Lesotho)	
Maluti (Lesotho)	
MOH	Ministry of Health
NGO	nongovernmental organization
O&M	operations and maintenance
RWSSP	Rural Water Supply and Sanitation Project
UNDP	United Nations Development Program
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
VDC	Village Development Committee
VLO	Village Liaison Officers
VWC	Village Water Committee
VWSS	Village Water Supply Section
WASH	Water and Sanitation for Health Project
WS&S	water supply and sanitation

A

USAID RURAL WATER SUPPLY AND SANITATION PROJECT IN LESOTHO

1 Goals of Lesotho Rural Water Supply and Sanitation Project

The USAID-funded Rural Water Supply and Sanitation Project (RWSSP) operated from March 1981 until August 1989 at a funding level of \$12,036,000.

The stated project goal was "to assist the government of Lesotho in improving the health and basic living conditions of Lesotho's rural poor, who comprise approximately 94% of the population." The purpose and principal focus of the project was "to assist the government of Lesotho in developing the institutional capacity of the Village Water Supply Section (VWSS) to design, construct, and maintain new and existing rural water supply systems which adequately reflect health and sanitary education considerations."

Five specific outputs were detailed in the original project paper:

- To train Basotho (the people of Lesotho are referred to as "Basotho"), including three long-term engineers trained to B.S. level, 20 long-term participants trained in specific technical skills, and 547 villagers trained as "waterminders" (or unpaid guardians and maintenance workers);
- To construct new and reconstruct existing rural water supply systems (142 new and 68 reconstructed systems over the first seven years of the project);
- To establish regional and district maintenance centers (one regional and three district centers);
- To improve organizational and operational procedures (focus on tasks such as planning, transport management, financial record keeping, and material and inventory management);
- To improve coordination between the Ministry of Health (MOH) and the Ministry of Rural Development (by providing a health education specialist to work with the MOH health education unit).

2 Sector Background

The RWSSP was preceded by a series of activities that provided the background and context for this project. During the several decades prior to the RWSSP, the government policy was that villagers should initiate requests for improved water supply through the Village Development Committee (VDC). The VDC was expected to collect and donate some of the funds for construction and provide unskilled labor. The government would provide skilled technicians and additional funds (usually from a donor) to complete the system. This self-help approach continues to be the basis for establishment of rural water supply systems in Lesotho.

By the late 1970s, researchers and sector specialists identified a number of problems with this approach, several of which still have not been completely addressed. First, the demand for systems far outstripped the government's ability to provide them. (This problem has now largely been addressed by the RWSSP and other donor-funded projects.) Second, it was not clear to villagers what happened to the funds they had collected and deposited with the government. This was a particular problem when villagers all too frequently encountered delays in establishing water systems. Third, the self-help assumption was that villages would be responsible for all maintenance, though in many cases they did not have the technical capacity, local funds, or government backstopping necessary for the task. Finally, politically based VDCs managed the program with political favoritism, from the government level to the community level.

Such situations prompted a series of recommendations for the future of Lesotho's rural water supply program, including:

- Dispose of the backlog of requests for new water supply systems but maintain and rehabilitate existing ones, while establishing clear criteria for village selection to allow rational prioritizing of plans and schedules for the future;
- Build an institutionalized maintenance capability, with the government responsible for major repairs and system renovation and villagers (trained as "waterminders") responsible for minor repairs;
- Use village funds to establish a maintenance fund and develop nonpolitical, locally elected Village Water Committees (VWCs) with strengthened District Community Development Officers providing management training;
- Encourage donors to support capacity building for the entire sector rather than fund isolated projects.

3 Project Activities

The major activities of the RWSSP were to strengthen the VWSS and continue construction of new water systems to increase the availability of potable water to rural Lesotho. These activities respond to the sectoral development goals and the need for accelerated construction as expressed prior to project initiation. Although never explicitly stated in project documents,

it is clear that these construction and coverage goals were driven by the International Drinking Water Supply and Sanitation Decade (IDWSSD) goals, which were formulated in the late 1970s and restated for Lesotho in a sectoral action plan in 1983.

The RWSSP also included health education components and a sanitation component. The health education component consisted of placing an expatriate health educator with ties to the project in the MOH. His initial two-year contract was extended to more than six years. The rural sanitation component was to be addressed initially through a series of "sanitary experiments," including pilot projects in latrine construction, clothes washing facilities, and communal showers. As the project developed, a much larger pilot rural sanitation project was launched with support through UNDP and UNICEF. USAID decided that rather than initiate additional activities, it would support this pilot project.

In response to a clearly expressed need, the RWSSP focused initial project activities on strengthening the maintenance capability of the VWSS. This work was supported by the five-year efforts of a maintenance engineer who, with a Danish volunteer, helped expand the vehicle, drill rig, and water system maintenance section from a small nucleus of mechanics to three regional workshops, three regional repair teams, and a preventive maintenance team. Three regional system maintenance teams were also established, along with a team stationed at Mafeteng to focus specifically on handpumps. The RWSSP maintenance effort appears to have been focused more on establishing VWSS capability as expressed in the project paper and less on developing the capability of villages to manage, operate, and maintain their own systems. Establishing VWCs, ensuring collection of funds for maintenance, and naming and training "watermindes" was left largely to the District Rural Development Officers (DRDOs) and the training section of VWSS. Specific sustainability goals were not explicitly stated in the project paper, nor were indicators related to sustainability.

4 Achievements and Current Status

The RWSSP's accomplishments were impressive as measured against stated project goals. The project completed 605 systems serving more than 310,000 people, far surpassing the original goal of 210 new and reconstructed water supply systems serving an estimated 180,000 people. It established three regional and one district maintenance center (in Kubutswana, Mohale's Hoek, Maputsoe, and Quthing). Three engineers were trained; 90 staff members received long-term in-country training; and more than 2,500 "watermindes," village health workers, government extension workers, and others attended short-term training courses. As a result of RWSSP, the VWSS is a much more mature organization than at project inception. Its staff has grown from 100 to 328 members and its organizational structure is clearly defined. The expatriate health educator, who spent six-and-a-half years on the project, improved coordination between MOH and the VWSS.

The success of the RWSSP was achieved through substantial support from the Government of Lesotho (GOL) as well as a number of other donors, including the Swiss, the British, the

Germans, UNICEF, and the EEC. HELVETAS, a Swiss NGO, supported the institution capacity-building process during the RWSSP and continues that work today.

In spite of the gains in rural water sector organizational development and the impressive construction record during the RWSSP, several issues remain. Some may directly impact the sustainability of project benefits and the measurability of those benefits. These issues can be grouped into five broad, interconnected categories:

- Sectoral policy and institutional development;
- The legacy of the focus on construction;
- Village-level organizations;
- Operation, maintenance, and cost recovery; and
- Health benefits.

4.1 Sectoral Policy and Institutional Development

The VWSS does not have a general policy clearly stating its goals and strategies for achieving sustainable water supplies or sustainability as an institution. As a result, no guidance is available for individuals within the VWSS when making decisions or for government administrators responsible for the section. This makes it difficult for the VWSS to implement decisions it sees as vital to effective operation, and it allows the government or donors to make decisions that are not consistent with institutional development and long-term sustainability.

Specific policies regarding government roles in operations and maintenance, privatization of maintenance activities, and payment for maintenance services are either nonexistent or difficult to administer. For example, the 1991 policy for the recovery of maintenance costs mandates that villagers pay the government a percentage of maintenance or repair services rendered. However, the VWSS is not legally mandated to accept payment so monitoring repayment rates is difficult. In addition, the definitions of routine maintenance (to be performed by villagers) and major maintenance (to be performed by the VWSS) are open to broad interpretation. Other avenues for maintenance and repair, such as contracting with the private sector, are not identified.

In addition, the VWSS believes that for progress to occur, construction must be prioritized geographically. It believes that management and transportation efficiencies can be achieved by concentrating work in limited areas. However, current criteria for village selection and the criteria specified by donors limit the ability of the VWSS to implement this policy. With no clearly stated policy, donors can and have constructed water supply systems without following accepted design standards or accepted community management and financial contribution approaches.

Today, the VWSS still depends heavily on expatriate staff, both in line positions and as advisors. The senior engineer responsible for the VWSS is a Mosotho, but half of the

headquarters senior staff are expatriates and six of 13 regional and district engineers are expatriates. This situation is largely the result of the growth of the VWSS and its status in government as a section rather than a division. Division status would upgrade salaries to a competitive level that would help the organization retain engineering and senior technical staff.

4.2 Legacy of Focus on Construction

The legacy of the focus on construction fostered during the RWSSP has been to leave the maintenance aspects of rural water supply in the shadows. For a while, the VWSS encouraged competition among districts for coverage goals. During one four-year period, a cup was awarded to the district that constructed supplies that served the largest population. Although VWSS management understands that this construction bias cannot and should not continue, changing course is difficult when the VWSS staff includes 36 construction teams and donors continue to be interested in funding construction activities. While funding levels for construction will decline, as they have already with the completion of the project, shifting focus to the more difficult tasks of operations and maintenance (O&M) management at the government and village level will not be easy. The magnitude of the maintenance problem is not known. Both observations and statistics suggest that communities are not coming forward when problems occur either because they don't know the procedure or they are concerned about the cost (now that a limited cost recovery program has been implemented). Because VWSS does not know the status of many systems installed during the 1980s, it is hampered in any effort to increase the focus on maintenance.

4.3 Village-level Organizations

Perhaps one of the most difficult problems has been the development and strengthening of village-level organizations. The RWSSP incorrectly assumed that the District Community Development Officers (later named DRDOs) would provide the necessary information for communities to apply for an improved water system and the necessary support to establish functioning VWCs capable of managing and maintaining water systems. The DRDOs had neither the resources nor the training necessary to adequately fulfill these functions while continuing their other duties. The ongoing focus on construction did not allow the program to slow down and work to solve these obvious problems. There are currently many reports that VWCs have stopped functioning, that communities do not fully understand their roles in O&M, and that the village-level organizations required to operate and maintain systems have largely broken down. As a result, the VWSS plans to establish a Village Affairs Office and district-level Village Liaison Officers (VLO) who will be responsible for strengthening the VWCs.

4.4 Operations, Maintenance, and Cost Recovery

The RWSSP outlined an initial cost recovery plan, which the government implemented several years ago. The plan requires villagers to support the water systems with the maintenance funds collected when the systems were constructed. The obligations of the government and the villages, however, are open to interpretation. No clear definition of major or minor maintenance is provided, and, since the government is responsible for rehabilitation (with donor assistance), villages may not have the incentive to maintain their water systems properly. To date, villagers pay about 50 percent of invoiced costs. However, it appears that these costs are being paid from accumulated funds and the VWCs may not be able to collect additional funds once these are exhausted. VWCs do not have a legal mandate to force compliance with household collection policies, and many villagers appear to believe that the funds collected at the time of construction should cover O&M needs forever. The VWSS is aware of these problems and is attempting to address them. In the process, it needs to define what maintenance and repair procedures will and will not be invoiced and to educate and inform villagers of their responsibilities, financial and otherwise, in the implementation of the cost recovery program.

4.5 Health Benefits

Many rural water supply projects in other countries have been predicated on improving rural health. In Lesotho, where malaria, schistosomiasis, sleeping sickness, filariasis, and many other water-related diseases are not a problem, health benefits are more difficult to determine. Clearly, diarrheal diseases are still an important problem. According to a mid-1970s study, they accounted for 11 percent of hospital reportings and 20 percent of sicknesses in children under five years. However, research has indicated that the availability of clean water has not affected the prevalence of water-related diseases. It was suggested that this was because there had been no behavioral changes. Water-related diseases (which include diarrheal disease and gastroenteritis) are spread not only by water but by other vectors such as flies. It is often stated that clean water is a necessary but not sufficient condition for improved health. Clean water provides the means to break the cycle, but villagers' behavior allows the cycle to continue.

These findings indicated a need to integrate health education into rural water supply programs. Studies financed by the RWSSP largely confirmed earlier studies. A 1986 report indicated that only *Giardia Lamblia* is significantly reduced by the installation of improved water supplies. Incidence of diarrhea is not significantly affected. A knowledge, attitudes, and practices (KAP) study in 1986 indicated that while survey respondents were generally knowledgeable about hygiene, they did not significantly alter their behavior. Despite efforts to link health education to installation of improved water supplies, substantial work in developing relevant health education material, and training of village health workers, the RWSSP intentions have not been carried through. Health education was undertaken as a broader topic with priorities in the expanded program for immunization (EPI) and sexually transmitted diseases. Difficulties were compounded by the high rate of installation of improved water supply systems and the limited staff capability of the MOH's Health Education Unit. This has led villagers to believe

that the major benefits of rural water supplies are convenience and labor savings. Improved health benefits will be realized not just by constructing water systems but by also improving hygiene, a task that was not included in the project design objectives of the VWSS.

Improved sectoral coordination, provided by an expatriate health educator, was a specified output achieved by the RWSSP. This affected the relationship between the VWSS and the MOH, which included Health Education and the Rural Sanitation Project. These two agencies completed what had come to be considered the three necessary components (water, sanitation, and health education) for a successful RWSSP. Unfortunately, at the project's conclusion this coordination deteriorated. Today, after a lapse of several years, an inter-ministerial Sector Coordinating Committee has been formed under the direction of the Ministry of Planning. Greater coordination and collaboration among the VWSS, the Health Education Unit, and especially the National Rural Sanitation Program is now being encouraged.

5 Evaluation of Sustainability

As described in Volume I, the procedure for determining sustainability is based first on an evaluation of what percent of the target population continues to be served and what percentage of systems are operational. Then a series of key questions are posed to determine the relative importance of various factors in influencing sustainability. The results of the WASH sustainability analysis in Lesotho are detailed in the following paragraphs.

5.1 Water System Usage

The VWSS does not keep an accurate record of the operational status of the more than 1,500 water supply systems in the country. During the short WASH consultancy to Lesotho, it was possible to visit only a fraction of the 605 water systems built under the RWSSP. During four days of field visits, one WASH consultant observed water supply systems in 21 villages. Based on a field estimate of coverage percentage and the population figures available for each village, an estimated 70 percent of the target population is still using the water provided by the water system.

Two recent surveys of selected samples of village water systems, a drought relief survey and a survey of gravity systems in Quthing, were available for corroboration of field observation. The drought relief survey, based on a sample of 214 villages nationwide, suggests that 65 percent of respondents with gravity systems and 57 percent of respondents with handpump systems are receiving adequate water. Ten percent of this sample were USAID-funded sites, with 82 percent of respondents reporting adequate water supplies. The maintenance engineer at the VWSS studied eight gravity water supplies in Quthing (seven were USAID-funded) and found that although three of the systems need relatively major repairs, 80 percent of those originally served by the systems continue to be users. In any case, the criterion that a majority of the target population continue to use the water supply systems is clearly achieved.

5.2 Operational Status

Of the 21 villages visited, 10 had handpump systems, eight had gravity systems, and three had diesel pumping systems (all funded through RWSSP). All of the gravity systems and 42 of 51 handpumps were operational. Two of the three diesel pumping systems were operating.

The villages represented a small percentage of the 605 water supply systems funded through the RWSSP. Therefore, efforts were made to substantiate these observations. Two studies were available: the Quthing study mentioned earlier and a study of handpumps in the Maseru District. The Quthing study of eight gravity systems suggests that, in spite of the needed repairs mentioned above, all are operational. The Maseru District handpump study of 656 handpumps (147 were RWSSP-funded) indicated that 84 percent (81 percent of RWSSP-funded) were in working order. Of the operating handpumps, 16 percent (14 percent of RWSSP-funded) were in need of repairs. These figures are in general agreement with the results of the present WASH survey and indicate that more than 75 percent of pumping systems remain in working order.

6 Assessment of Factors Affecting Level of Sustainability

The key questions to ask in determining the relative importance of various factors in achieving sustainability are addressed in the following sections. They include categories related to institutions, development processes, technology, project management, donor inputs, and context.

6.1 Institutions

Do national agency actions manifest a long-term commitment to project goals?

In Lesotho, the institutions involved in rural water supply include the VWSS national headquarters; three regional offices; 10 district offices; a variety of donors; the District Rural Development Office; the private sector (as manufacturers, importers, and, until recently, maintenance contractors); and VWCs. The VWSS and the donor community continue to be committed to the RWSSP goals of improving the health and basic living conditions of Lesotho's rural population. This is expressed in annual work plans, project evaluations, and discussions with VWSS staff. The Government of Lesotho continues to fund much of the ongoing rural water sector activity and to actively seek donor contributions in the form of grants and loans to supplement government contributions.

Is there a national policy statement that clearly defines (1) the respective responsibilities of the government, the community, and the private sector; (2) financing mechanisms; (3) equipment standardization; and (4) arrangements for providing spare parts?

The most recent rural water sector policy statement dates from 1983, when the government responded to IDWSSD goals by formulating sector goals for Lesotho. The increasing burden of maintaining water systems has superseded this statement, which focused on construction and coverage targets. The VWSS, along with several donors, realizes that a new policy statement is required that will shift the focus from construction to maintenance financing, community issues, and sustainability. To date, no such policy statement has been approved.

Do regional agencies have work plans for extension activities that include reinforcing health education messages and periodic (semiannual at least) monitoring of community activities?

Regional and district offices of the VWSS submit periodic progress reports that include a section on maintenance matters. For the past several years, annual work plans have been developed and appear to be used to guide activities at the district level. This past year, the plan was not completed due to the immediacy of the recent drought; however, the process seems to be an integral part of the functioning of the VWSS. Health extension activities are not a part of the VWSS mandate and are not included in the activities of the regional or district offices. The DRDO is responsible for monitoring community activities and assisting in strengthening the VWC. The DRDO is not administratively associated with the VWSS, and problems in the coordination and support the DRDO receives from the government have significantly reduced the effectiveness of community organizations. Current VWSS plans include the formation of an internal Village Affairs Office and district-level Village Liaison Officers to help strengthen the VWCs.

Are community WS&S committees or key individuals confident of managing the facilities and related activities?

It does not appear that VWCs view themselves as capable of fully managing water supply facilities. While the self-help program that establishes water supply systems requires the formation of VWCs, it appears that often they were formed without the necessary management training and without a clear delineation of community responsibilities. As a result, some VWCs are not fully functional and others do not have the technical and management skills to make informed decisions. Many VWCs remain unclear about maintenance and repair procedures. In addition, more complex tasks, such as borehole cleaning or repair of spring capturers, leave villagers dependent on the VWSS and its funding and scheduling constraints.

Are users satisfied with the service provided and content to see no changes?

All villagers interviewed expressed satisfaction with the water supply systems in their villages. This may be due to the self-help approach that requires community mobilization and contribution. No one suggested that government should provide upgraded services at no cost. The only hint of general dissatisfaction arose from the relatively large number of handpumps that are on borcholes with limited yield.

Are more women serving on WS&S committees and participating in activities than when the project began?

Women are serving on VWCs in large numbers, but it is not certain whether this is a result of the RWSSP or because an unusually large number of males are absent from villages while they work in South Africa. Of the 25 VWC members the WASH consultant met during field visits, only four were male. Field visits also included one site where a village system was being constructed, one village where a borehole was being cleaned, and one village where rehabilitation was taking place, and in each case, women supplied the labor.

Are trained mechanics available to maintain and repair the facilities?

Villages are able to perform some minor maintenance themselves but depend heavily on government assistance. All of the district VWSS offices have maintenance teams. Maseru and Mafeteng districts have both handpump and gravity system maintenance teams. Mphahle's Hoek has one team, with a staff of four assigned to maintenance. In the mountains, where few if any handpumps are installed, only gravity system maintenance teams exist. The few diesel and electric systems are maintained by regional teams for the most part. All of these teams have adequate transportation (provided by donors) and appear to be equipped to handle almost all contingencies. There is concern that villages are not sufficiently briefed to know how to access this maintenance resource and that the recently instituted cost recovery policy has resulted in broken equipment not being reported. A pilot project to introduce the maintenance program to the private sector (as designed by WASH in 1989) is being reassessed. Since the VWSS continues to check on faults and monitor repairs, arguments are being made that no overall savings to the government are being realized.

Is there an importer or manufacturer of spare parts and a system for distributing them?

A number of importers of pipes, fittings, and cement are required for gravity systems as well as for the diesel and electric systems that are manufactured or imported through South Africa. Mono handpump spares are readily available. Although most components of the Maluti handpump originate in South Africa (as with the Orbit handpump), some parts are fabricated in Lesotho. However, spares for the Moyno handpump, imported directly from North America, are not available. An importer was identified, but the excessive cost (related to shipping and the unfavorable dollar/rand exchange rate) has caused the VWSS to pursue a policy of Moyno replacement when pump breakdowns occur that cannot be repaired with spares scavenged from other pumps. This is unfortunate for several reasons. First, villagers express a preference for the Moyno pump, as they say it is easier to use than the Mono and Maluti. Secondly, the RWSSP imported the pumps under a sole source waiver written into the contract documents. According to the project document, it was "precisely on the issue of pump maintenance that the proprietary procurement is justifiable."

6.2 Development Process

Did design documents spell out sustainability as an objective to be attained?

Although the project design documents did not list sustainability as a project objective, considerable attention was paid to maintenance issues, including maintenance of vehicles, drill rigs, and water supply systems. An expatriate advisor was provided for the initial five years of the project to strengthen the maintenance capability at all levels within the organization. Issues now understood to be important for sustainability, such as community involvement, were not part of the project brief. These issues were to be addressed in collaboration with the DRDO and his staff at the district and village level.

Did communities have a say in problem identification and project design?

All water system designs for gravity and handpump systems are now completed at the district level. This allows for closer coordination between communities and the VWSS design and construction process. It appears that communities have input into various aspects of project design, particularly as it relates to standpipe location in gravity systems and to some degree with locations of handpumps. However, technical considerations and design standards take precedence over the villagers' wishes.

Was a baseline survey carried out to verify project assumptions and obtain information on knowledge, attitudes, and practices related to WS&S?

A baseline survey was not completed at the beginning of the project to verify project assumptions. The project preparation team did have a number of relevant documents to draw from, the most important being the "Lesotho Village Water Supplies Ex-Post Evaluation Final Report" by Feacham et al., completed in 1977. A KAP study and a health impact study were completed in 1986, five years into the project. These reports, among others, have had an effect on the long-term thinking regarding rural water supplies, but did not appear to have a large impact on the closing years of the RWSSP. Policy and program changes have not occurred quickly in Lesotho.

Did participation processes include the empowerment of communities so that their opinions were considered throughout the project cycle?

The project used a self-help approach to identify and construct rural water supplies in keeping with earlier efforts and government policy. The position of DRDO was designed as the link between the community and the VWSS. The DRDOs were to build village institutions, assist in empowering villagers, and help bring rural development project benefits to communities. As discussed earlier, the DRDOs were not up to the task.

Do WS&S communities participate in O&M management and financial decisions?

Communities, in accordance with requirements for construction of a water supply system, collect money to maintain the completed water system. An amount of 10 Maluti per household was commonly collected and deposited in an account in the name of the VWC. Until recently, maintenance of gravity and handpumps was performed upon request by VWSS maintenance teams at no cost. With the initiation of a cost recovery policy, communities are now expected to use the maintenance fund that was collected and augment it as necessary to pay for repairs that cannot be completed by the waterminder. Since formal requests must still be received by the VWSS prior to completing repairs, village members do control O&M management. It appears that financial considerations, rather than the continued smooth functioning of all water system components, often drive community decision-making.

Is there evidence of positive behaviors related to improved hygiene (such as proper storage of water, use of soap, and clean latrines)?

While a limited number of visits makes it difficult to verify positive behavior regarding the water systems, several reports indicate that the health impact of an improved water supply is minimal or nonexistent because the water is often recontaminated once it is taken from the tap. The interiors of several latrines inspected were clean, although the outside appearance of many suggest that this may not be the norm. Women collecting water were found to carefully rinse containers prior to transporting water to the home.

Is there demonstrated knowledge of the causes of diarrhea and other water-related diseases and ORS preparation?

Both research and questioning indicate that people are largely aware of the causes of diarrhea and other water-related diseases. Most women questioned knew that dirty water causes diarrhea. However, as suggested by the KAP study, knowledge does not always translate into behavioral changes. This and earlier studies indicate that villagers want a water system mainly for convenience. This was verified in several of the villages visited during this evaluation.

Do communities receive information about WS&S through the media or extension agents?

Once water systems are completed, a broader effort to provide health messages to villages is established. This includes having a wide range of health workers (village health workers, public health nurses, nurse clinicians, and health assistants), agricultural extension agents, rural development officers, and teachers relay health education messages to the community. Six 15-minute spots with water-related messages are reserved for radio broadcast during the peak diarrheal season. All indications are that messages related to water supply and sanitation are reaching rural dwellers even when these messages included information on child care, nutrition, sexually transmitted diseases, and other health issues.

Do WS&S committees have adequate communication channels with government agencies and the private sector to express community needs?

The VWCs do not appear to communicate adequately with government agencies to express their needs. Since the DRDOs, who are responsible for this communication link, have not been effective, the Village Affairs Office and the VLO are being introduced into the VWSS.

Are O&M roles clearly defined and understood by all responsible parties?

O&M activities were detailed in the project design document, but the roles were not clearly defined. The project sought to train personnel in all aspects of corrective and preventive maintenance for systems to be installed and provided a stock of spare parts equal to 15 percent of equipment purchases along with a stock of spare handpumps. All of these efforts suggest that the VWSS would perform system maintenance, but even today, it is not clear what roles the community, the government, and the private sector have in maintenance and repair.

Clear definitions of minor and major tasks have to be established. The issue of financing maintenance also has to be addressed. Although the government recently introduced a partial cost recovery system for maintenance, it is difficult to administer because payment is made to the revenue office, not the VWSS, and because the VWCs do not have statutory power to collect fees. This situation is exacerbated by the VWCs who do not understand how to request repairs and what financial contribution is expected from them.

Is the ownership of WS&S facilities clearly defined?

Government policy states that communities own their water supply system and retain overall responsibility for O&M; however, no formal contract or procedures make this apparent to villagers. In addition, until recently the VWSS appeared to contradict this policy by performing all maintenance free of charge, and many villagers still expect VWSS to do so. The VWSS encourages this view, as they feel an obligation to the donors, who provide most of the capital cost to ensure that investments are maintained. Without formal requirements, villagers may not maintain systems properly and an increase in major repairs and costly rehabilitation will result.

Do the responsible parties (communities or government agencies) have the resources to cover recurring O&M costs?

In many cases, VWCs have never needed to tap the maintenance fund established at the time of construction. This would suggest that resources are available. Many rural dwellers are poor (indications are that between 15 and 20 percent are without disposable income), but most have some resources through relatives in the South African mines, although this situation is deteriorating. However, the VWSS cost recovery policy is lenient. Costs are based on the actual cost of spare parts and on-site labor, with a maximum of 1 Loti per household per repair invoiced to the VWC. The government continues to depend heavily on donors for

equipment and salaries of district maintenance staff. On average, half of district staff hold established posts and the remainder are funded through GOL recurrent budgets or direct donor assistance. All vehicles are provided by donor funds. Loss of donor support would severely hamper capital construction activities and would clearly impact maintenance as well.

Has the project been monitored to verify that all benchmarks of progress, such as the items in this list, have been met? (The baseline survey is an important tool in determining benchmarks.)

Little monitoring took place during the project. The project annual reports carefully and completely documented all progress towards project goals. The aforementioned KAP and health impact studies were the only efforts to document health-related benefits. No broad effort to document system sustainability was conducted during the project or since its completion. Recently, the position of Planning, Monitoring, and Evaluation Engineer was established in the headquarters section to begin to address the long-range policy and strategic planning needs of the organization. Among recent initiatives is a planned coverage survey. Terms of reference were established for determining the operational status of all 1,500-plus water systems completed over the past several decades. Such status reports are necessary since the VWSS has no real way of knowing the operational status of systems and suspects gross underreporting of faults. The results of this report will help refocus VWSS priorities towards a more balanced approach that involves reduced emphasis on construction and increased attention to maintenance.

Did communities take part in the evaluation design and the review of conclusions as a means of indicating whether they were satisfied with project benefits?

Communities did not and have not taken part in project evaluations and design reviews. However, VWSS staff have made significant contributions to recent planning and evaluations studies conducted by other donors, HELVETAS in particular.

6.3 Technology

Were selected technologies the most appropriate in terms of affordability and the level of service desired?

Clearly gravity systems are the best technical alternative when water sources and topography allow, and when possible, gravity systems have been promoted. In lowland areas, handpumps have been the technology of choice, and this too appears to be the best alternative. Multiple pumps in villages provide water security and keep operational costs low. Unfortunately, villagers often cannot maintain and repair handpumps themselves, so outside assistance, normally from the VWSS, must be obtained. As suggested above, availability of spare parts for the Moyno pumps has been a problem and, in spite of the justification for a sole source

waiver, the Moyno does not now appear to have been the best possible choice. Locally available pumps and spare parts have proven more appropriate choices.

6.4 Project

Was the project managed within the existing institutional structure to facilitate continuation of activities after it ended or was a special project organization created?

The RWSSP was originally intended to take place outside the existing rural water supply structure, but on USAID insistence, it was placed within the VWSS. This decision greatly enhanced the project's ability to function and facilitated the incorporation of institutional gains made during the project within appropriate government agencies. It should be noted that the VWSS has had several homes within the ministerial structure of GOL and appears to be headed for a new home in the Ministry of Water Energy and Mining. It is hoped that this transfer will be accompanied by an upgrade to department status, reflecting the importance, capabilities, and staffing of the VWSS.

Were at least 15 percent of project resources spent on institutional building activities, including the training of trainers?

Training was a major component of RWSSP. Details of this training were discussed earlier. The training effort accounted for under 4 percent of the overall project budget. The largest budget items included commodity procurement (40 percent) and technical assistance team costs (36 percent). Discussions with VWSS staff indicated that they have the technical capacity required to complete their tasks and a dedication to the cause of rural water supply in Lesotho. It seems that the level of training provided by the RWSSP and other projects has been sufficient, at least for the VWSS staff; however, more attention should have been paid to village-level hygiene education and management skills.

Was there evidence of flexibility in adapting to problems related to sustainability during the course of implementation?

Initially, the project concentrated on upgrading maintenance capability, and sustainability was not seriously considered until late in the project. As the project developed, the weakness of the DRDC cadre and the need to improve village-level management became ever more apparent. A village water supply management study was conducted in 1984, and a village water supply management handbook was produced in 1987. At that time, it appeared that the DRDOs could provide the necessary community support and that major changes in project strategy were not necessary. WASH conducted a privatization study in 1987 in an effort to address what was clearly becoming a greatly increased maintenance requirement resulting from the aggressive construction program. This was followed by a pilot privatization program conducted in Maseru, Berea, and Leribe Districts that was completed in early 1993. Hence,

the RWSSP did exhibit flexibility within the confines of specific program targets outlined in the project paper. However, policy and program redirection required more time than was available once sustainability issues were recognized. For example, the draft cost recovery program first outlined and proposed by the RWSSP in 1986 only became a formally approved policy in 1991, two years after project completion.

6.5 Donor

Has there been continuing donor interest prior to and during project implementation in sustainability and the eventual transition to post-project status?

One of the major achievements of the RWSSP was the integration of a number of donor projects into an effective overall water supply construction program. The program used resources from various projects to benefit the greatest number of people. This maximized the impact of donor funding and generated continued interest in supporting the sector. The Swiss NGO HELVETAS has supported the institutional evolution for the VWSS since 1978, prior to the initiation of the RWSSP, and continues to do so now that the project is completed. VWSS and HELVETAS are now focused on consolidating rural water supply gains and realigning priorities to address sustainability. The establishment of the Village Affairs Office and the district VLO is a major step in this effort. The need for these changes has become increasingly apparent as more and more systems are completed and the prospect for future donor funding for construction grows less certain.

6.6 Context

Have there been any contextual factors since the project was completed that have adversely affected the benefit stream (e.g., droughts, high inflation rates, political upheavals)?

The effects of the drought of 1992 continue to be seen, particularly in lowered borehole yields and reduced flows from captured springs. Ample rains in late 1992 and early 1993 have improved the situation somewhat, but water tables are not yet at normal levels. The drought also caused the VWSS to focus on addressing emergency needs and, as a result, planned activities were delayed. The drought did not appear to impact the long-term sustainability of rural water supplies. Nor has the very successful return to elected civilian rule early this year impacted sustainability thus far. It is possible that in the future, the villagers' ability to address needs through their elected officials may affect the priority given to maintenance. It is too early to predict what effect these political changes will have on VWSS policy.

7 Conclusions

Based on the criteria outlined in Volume I (that 50 percent of intended beneficiaries continue to use the water provided by project interventions and that 75 percent of systems are still operational after project completion), the benefits of the RWSSP have been adequately sustained. The critical contributing factors in this determination are the following:

- Appropriate technology choices were made by using gravity systems wherever possible and by using robust handpumps in lowland areas without gravity sources.
- Donors continue to support the VWSS by financing capital and recurrent costs and helping to focus activities on system maintenance and sustainability requirements.
- The VWSS staff is well trained, competent, and motivated to assist in the goals of providing clean water to Lesotho's rural population.
- Communities appreciate the labor saving benefits of improved water supply, they contribute to construction, and they appear willing to contribute to maintenance and repair requirements to continue to receive benefits.

Other factors are also important. The project implementation period of nine years under one contractor with TA staff continuity allowed for significant contributions to VWSS' technical capability and helped it to develop a mature approach to the rural water sector. The long-term commitment of Swiss aid under HELVETAS has also been important in focusing on institutional strengthening and policy development, as well as helping to refocus program efforts towards increasing institutional as well as system sustainability. The widely accepted self-help approach to rural development, which now includes a VWC, a maintenance fund, and the contribution of labor and in-kind assistance, contributes to the community's sense of pride in its accomplishments. Villagers are largely satisfied with the benefits they receive. The fact that Lesotho is near the industrial base of South Africa is a mixed blessing. On the one hand, the country has become dependent on remittances from Basotho working in South Africa. On the other hand, the skill levels of Basotho workers are quite high, and spare parts for regionally assembled and manufactured materials and equipment are readily available.

The long-term sustainability of rural water supply systems in Lesotho is vulnerable, in part for the very reasons that the current level of sustainability has been achieved. The following are major vulnerabilities:

- The VWSS relies too much on donors, not only for construction aspects of rural water systems but also for funding recurrent aspects such as staff salaries.
- Villages are overly dependent on the VWSS for maintenance support.
- VWC management capability is poor, due mainly to weaknesses in the DRDO cadre responsible for supporting the VWSS program by providing preconstruction village-level organization and follow-through training.

Past focus on construction and water supply coverage targets continues to drive much of the VWSS program. This is attributed to a legacy of government policies related to the IDWSSD goals and donor agendas. Following the completion of the RWSSP, the coordination so carefully cultivated between the VWSS and the MOH's Health Education Unit and Rural Sanitation Program has largely disintegrated. This limits the potential for maximizing the health benefits that could be available from improved water systems and hygiene education.

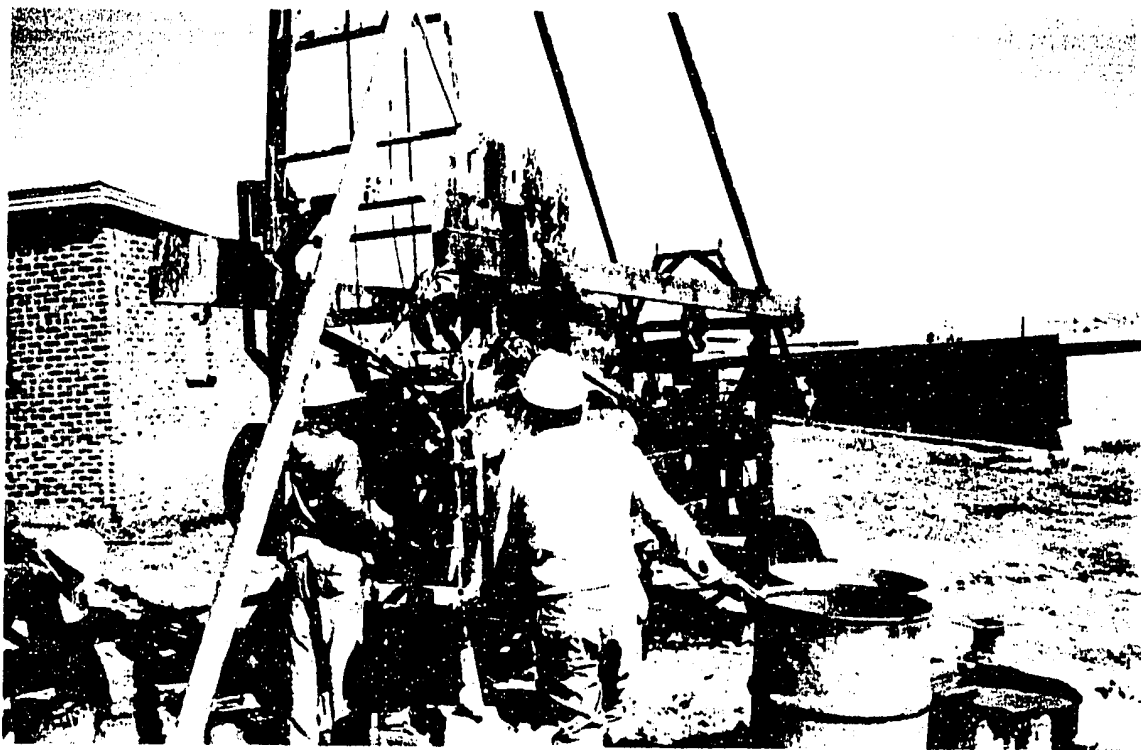
The evolving rural water supply program is making efforts to address these and other problems. Most notable is the recent establishment of the Village Affairs Office and VLO, who are expected to strengthen VWCs. The introduction of a cost recovery policy for rural water systems, although it has met with mixed success, is also a step towards the communities' increased self-reliance. The overall long-term outlook for gravity water supply systems is good. More cautious optimism is warranted for the longer term sustainability of handpump systems.



View of arid landscape near Hamakere in Lesotho highlands



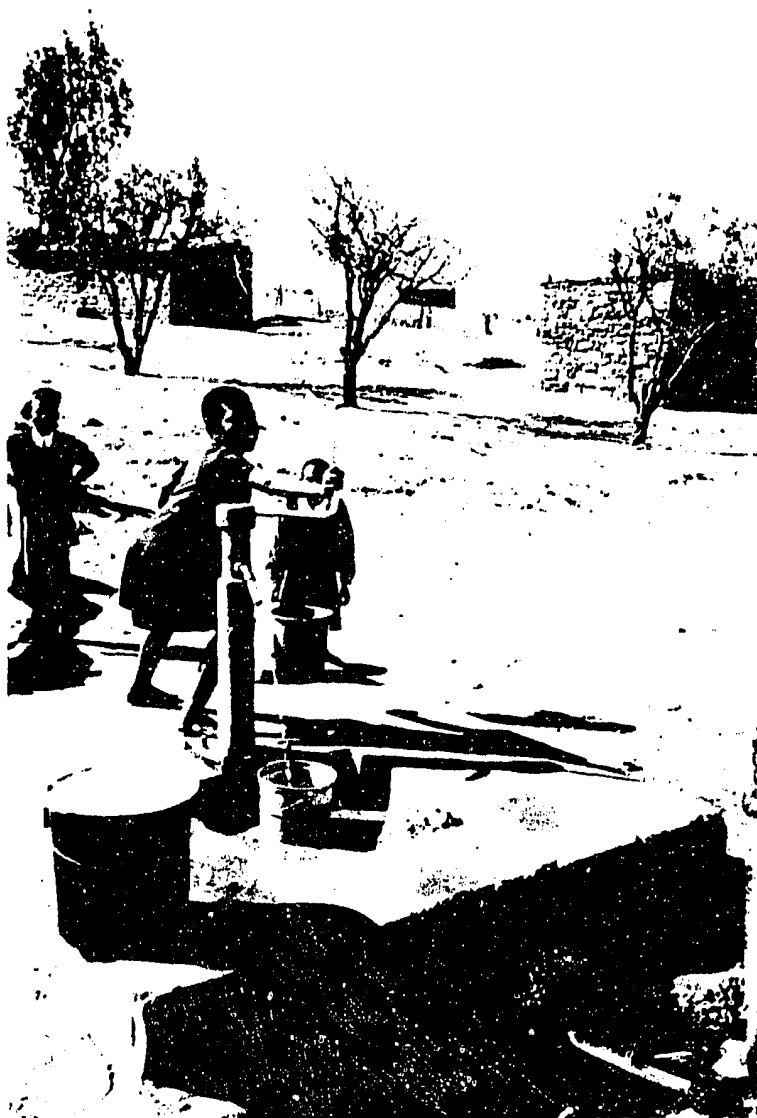
Collecting water from storage tank at Motsolwane



Local drillers building water well at Ha Sekepe



Women cutting pipe for water system at Linakeng



Children pumping water using a Mono pump
at Boluma Tau



Woman carrying water from nearby village at Boluma
because pump close to her home was broken

PERSONS INTERVIEWED IN LESOTHO

USAID

F. Gary Towery	Mission Director
Laura Slobey	S/GDO
George Kasozi	A/GDO
Gary Lewis	Chief, Agriculture and Rural Development

Village Water Section

K.W. Lesaoana	Senior Water Engineer
Jurg Christen	Advisor to Senior Management
Marcus Buzberger	PME Coordinator
M.D. Manzur Rahmam	National Operations Engineer
Patrick Goss	National Maintenance Engineer
Stefan Kessler	VWS Special Projects
Laxman Chhetry	Regional Engineer, Central
Issac Qobolo	District Engineer, Maseru
Thabiso Masitha	Maintenance Supervisor, Gravity Systems, Maseru District
L. Lethole	Acting District Engineer, Mafeting
L. Rammoko	Maintenance Supervisor, Hand Pump Systems, Mafeting District
R. Tsikoane	Maintenance Supervisor, Gravity Systems, Mafeting District
Ralithathne Matete	STO (Surveys & Design) and Acting District Engineer, Thaba Tseka District
Thelinoane Liolo	Maintenance Supervisor, Thaba Tseka District
Pule Kmamapepe	Construction Foreman, Thaba Tseka District
Frank Canavan	Regional Engineer, Southern Region
Margaret Miller	District Engineer, Mohale's Hoek
Karohano Moima	Maintenance Supervisor, Mohale's Hoek
Phillimon Nthabane	Maintenance Foreman, Mohale's Hoek

Ministry of Health

Mr. Hlabana	Coordinator, NRSP
Mr. K. Ntoampe	Chief Health Educator
Mrs. Malibata Matji	Health Statistician

Ministry of Planning

Mrs. Maema	Water Sector Coordinator
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Other

David Hall	Sechaba Consultants
Thuso Green	Sechaba Consultants
John Gay	Independent Consultant
Judith Gay	Former Consultant to the VWSS and RWSSP
Karl Wehrle	SKAT Consultant to VWSS
Lesodi Mahope*	Managing Director, Maseru Pumps and Plastics
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Appendix B

CARE-ASSISTED RURAL WATER SUPPLY AND SANITATION PROJECTS IN INDONESIA

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ACRONYMS

CMA	Community Management Approach
CSFW	Community Self-Financing of Water and Sanitation Systems
NGO	nongovernmental organization
NTB	Nusa Tenggara Barat (province east of Bali)
O&M	operations and maintenance
RCWS	Rural Community Water Supply Project
SRCD	Sulawesi Rural Community Development Project
USAID	U.S. Agency for International Development
WASH	Water and Sanitation for Health Project
WASHES	Water and Sanitation for a Healthier Environmental Setting Project
WS&S	water supply and sanitation
WSSPLIC	Water Supply and Sanitation Project for Low Income Countries

B

CARE-ASSISTED RURAL WATER SUPPLY AND SANITATION PROJECTS IN INDONESIA

1 Sector Background

Although there are several agencies of the Indonesian government responsible for the planning and management of rural water supply and sanitation, rural areas have been neglected in favor of the larger population centers largely because of the magnitude of the job, other demands on government budgets, and the relatively low priority given to the rural water and sanitation sector. During the last decade, most of the assistance in this sector has been provided by agencies like CARE with funds from USAID and CIDA.

2 CARE-Assisted Rural Water Supply and Sanitation Projects

CARE operates under an Administrative Arrangement Agreement with the Ministry of Home Affairs and under cooperative agreements with each province. It focuses on programs at the community level and has not attempted to build government agency capacity, strengthen institutions (except at the village level), or contribute formally to sector policy dialogue.

CARE has completed several rural community development and water supply projects in Indonesia since 1979. The first of these, the Rural Community Water Supply (RCWS) Project, operated in West Java, Bali, and Nusa Tenggara Barat (NTB) from 1979 to 1984. It emphasized as its goal the health benefits from reducing the incidence of water-related diseases, and used a community participation approach. In 1984, the Water and Sanitation for a Healthier Environmental Setting (WASHES) Project replaced RCWS. It dropped activities in Bali and started operations in the southwest part of East Java. Its principal goal was a "reduction in the incidence of water-borne disease in CARE-assisted communities," and its subordinate goal was to establish self-sustaining mechanisms for O&M. In 1988, CARE added a second phase to WASHES, with a goal "to accelerate access to reliable and adequate domestic water supply and sanitation facilities." Secondary goals included establishing self-sustaining mechanisms for O&M. CARE also began the Community Self-Financing of Water Supply and Sanitation Systems (CSFW) Project to increase access to water and sanitation facilities "through effective participation of rural communities in the independent financing and maintenance of water supply and sanitation systems." From 1979 to 1989, 259 gravity-fed water supply systems were completed and nearly 1,400 handpumps installed in the four provinces. The RCWS and WASHES I projects had distinct sanitation and health education components, which have been given less importance in more recent projects.

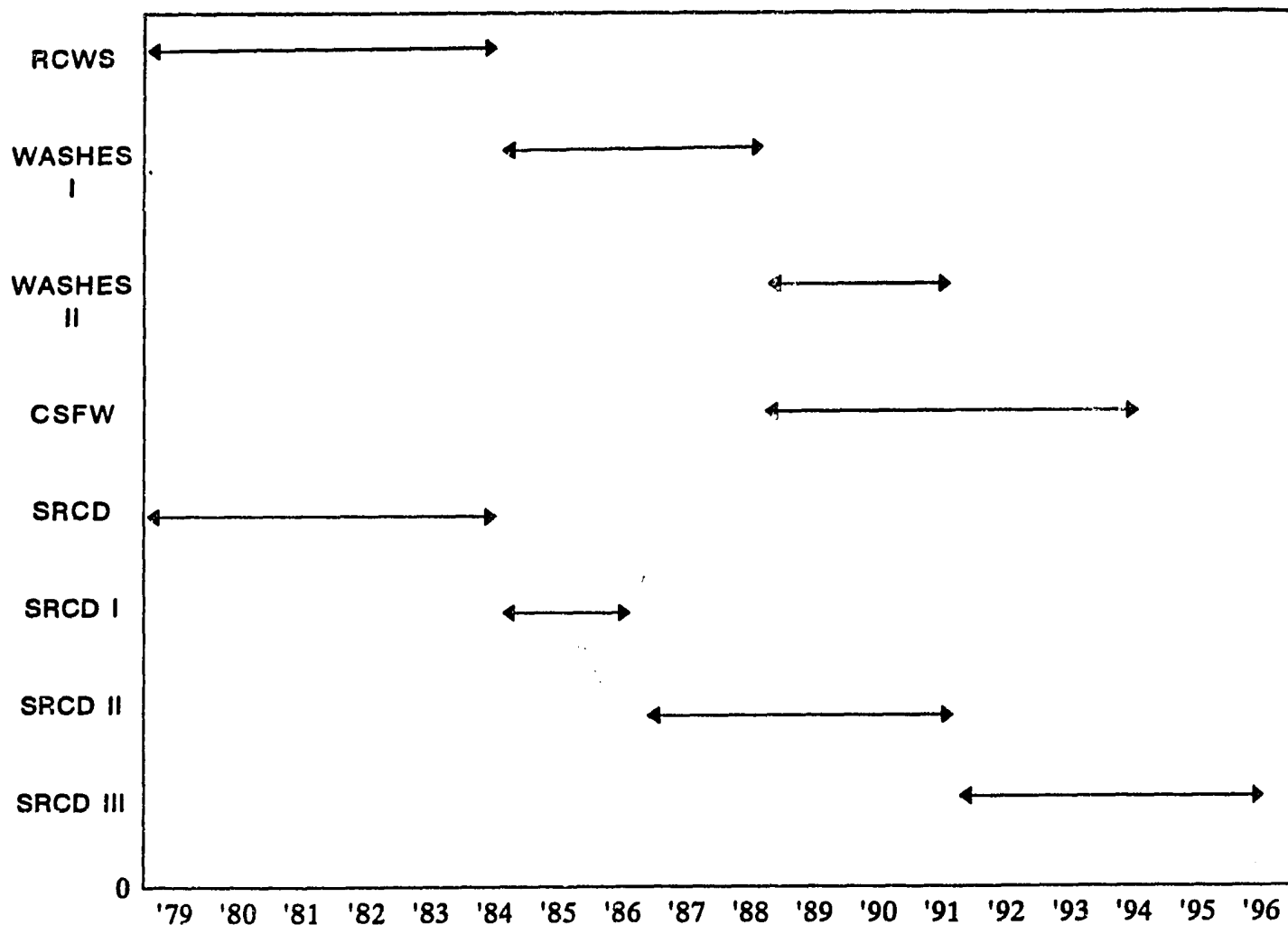
In Sulawesi, CARE has implemented four projects, all titled Sulawesi Rural Community Development (SRCD). The first ran from 1979 to 1984 in three of the four provinces—Central, South, and Southeast Sulawesi, and until 1980 in North Sulawesi. The focus of this first project was water supply system construction, with less emphasis on latrine construction and clinics. SRCD I, a CIDA-funded follow-on of this project, operated from 1984 to 1986 and turned to using water projects as a means to stimulate wider community development activities. Increasing emphasis was placed on health education, nutrition, and sanitation. In 1986, SRCD II added an income generating component that included simple technologies, household resource management, and village-level savings and loans. The principal project activity continued to be the construction of water supply systems, and, as in the WASHES projects, the secondary goal was to establish "self-sustaining mechanisms" for the O&M of these systems. Except for handpump installations in 11 villages in North Sulawesi and diesel systems in 8 communities in Southeast Sulawesi, the 223 water supply systems installed from 1979 to 1989 by the SRCD projects are all gravity fed. SRCD III, begun in 1991, has a goal of "strengthening Indonesia's planning base for sustainable water resources management and regional development," while continuing the construction of water supply and sanitation facilities. Table 1 provides the duration of each CARE project in Indonesia.

3 Achievements and Current Status

During the past 15 years, CARE's programs have evolved in response to lessons learned in Indonesia and elsewhere. The early projects, although based on community participation, were more concerned with completing the systems and with service delivery. During this first period, basic technical designs, which are still in use today, were perfected. As the CARE staff gained experience and perspective, however, community involvement assumed more importance, as exemplified by the creation in 1986 of village project implementation committees to mobilize resources and manage construction activities, and village water supply committees to oversee O&M. Recent projects place a significantly greater emphasis on community decision-making and management. A community management approach (CMA), in which CARE staff act more as facilitators than directors, was introduced in 1991 along with modules for training community members. During the 15-year period, community willingness and ability to pay for services have also been gauged more accurately. As a result, goals for community contributions, confined to labor and local materials in the early years, now include complete community self-financing of material and labor under the CSFW project. Five years ago, when the CSFW project was being formulated, the WASHES project averaged contributions of only 50 percent of total project cost. Although mobilizing community contributions has never been a part of the SRCD project, it has succeeded in achieving this.

Along with increasing community contributions came a reduced emphasis on health improvement and a greater emphasis on access to clean water. Projects in the mid-1980s required commitments from communities to build latrines before pipes for water systems were delivered. Some projects, particularly in Java, built water seal latrines as part of the water supply and sanitation facilities. With decision-making increasingly in the hands of communities,

Table 1
Duration of CARE Projects in Indonesia



emphasis on latrine construction has diminished. Both the SRCD and the CSFW projects are now moving towards providing house connections because experience suggests that people with house connections will build latrines and septic tanks. Although the WASHES II and CSFW projects do not stress better health as an objective, health education continues to be program components, albeit small ones. Health education strategies have changed a number of times over the past 15 years and consultants have identified weaknesses and provided guidance, but the expected degree of success has not been achieved.

The early projects involved communities in construction, trained local technicians to maintain and repair their water supply systems, and required that water committees be formed, but they did not give much attention to long-term O&M and training in management and sustainability. Sustainability was not a clearly articulated goal until WASHES II in 1989 and SRCD III in 1991, although O&M training began to assume importance before this. The encouragement of greater community participation in 1986 brought with it greater emphasis on the formation of village water committees for O&M, the training of committee members, and the collection of O&M fees. In Java, for the first time, these accumulated fees were put to other uses. Following this example, a number of communities now use them as a source of loans and for health insurance schemes, community loan funds, and other community activities.

Under RCWS, WASHES I, SRCD I, and the first years of SRCD II, 472 gravity-fed systems, 7 diesel pump systems, 7 hydraulic ram pumps, and nearly 1,400 handpumps were installed. CARE continues to focus on the water sector. In East and West Java and NTB, the CSFW project is in its last year. In Sulawesi, SRCD II has ended and SRCD III is in full swing. CSFW and SRCD III, funded by USAID and CIDA, respectively, are quite different, although they are developed from the same sectoral experiences. CSFW is an admittedly experimental project, pushing community self-financing to its limits. It is process-oriented and has no numerical goals or coverage targets, being interested primarily in financial resource mobilization, credit mechanisms for communities, community financial management skills, self-sustaining mechanisms for O&M, and ultimately in providing a model for other agencies in Indonesia. The SRCD III project has clearly stated numerical goals both for systems constructed and target populations served. It includes broader rural development activities, primarily related to the establishment of village credit unions and the promotion of health, hygiene, and sanitation.

What the two projects have in common is the CMA to implementing water projects and a continuing search for what this should mean in terms of technical standards, community perception of benefits, and pace of construction. Field officers are still learning how CMA works and are redefining their roles and responsibilities accordingly. Both projects also are becoming more involved with local NGOs as a way to promote the development approach of the past 15 years, whose successes are just now leading CARE into the policy arena as well. Current and former staff members are involved in the World Bank-funded Water Supply and Sanitation Project for Low Income Communities (WSSPLIC).

4 Evaluation of Sustainability

As described in Volume I of this report, the determination of sustainability is based primarily on the percentage of the target population being served and the percentage of systems still operational.

4.1 Population Served

Is at least 50 percent of the targeted population using the facilities?

Water supply systems in 50 villages were visited on field trips to 6 provinces. Thirty-eight of these systems were constructed at least five years ago. The oldest one dated from 1979. Thirty-one were gravity fed (4 with sand filters), 1 was equipped with a hydraulic ram, 3 had handpumps, 2 had diesel pumps, and 1 used rainwater catchment tanks. A conservative estimate of the population served by the 38 systems is now 86,000, or about 65 percent of the target population. Thirty of the systems built more than 5 years ago were operating at the time of the visits.

4.2 Systems in Operation

Are at least 75 percent of the facilities operational?

Thirty-one (7 percent) of 472 gravity-fed systems and 3 (2 percent) of 150 handpump systems were visited (44 of 1,400, or 3 percent of pumps). As indicated above, 30 of the 38 systems built more than 5 years ago are operational. This includes 27 of 31 gravity-fed systems (87 percent) and 2 of 3 handpump systems (30 of 44 pumps, or 68 percent, are operating). The handpump sample is insufficient to allow conclusions regarding the total operational status. The diesel sites were visited specifically because they were not operational. The status of one hydraulic ram (installed in 1979 and now serving only a few households) cannot be used to make broad generalizations. The rainwater catchment site was clearly a success (18 tanks built in 1984 with CARE assistance and more than 70 built by the community since then). Again, broad generalizations are not possible.

In 1991, CARE conducted a much broader study of all gravity-fed systems completed to that date and found that more than 80 percent continued to deliver at least 70 percent of their design flow to the target communities. This finding corroborates the conclusion that at least 75 percent of gravity-fed systems are in operational order. The field visits suggested that fewer than 75 percent of handpumps are operational, or that only 66 percent of communities provided with handpumps are adequately served. This belief that handpumps have not been sustained is shared by CARE field staff. A 1984 survey found that after an average of two years, a third of installed handpumps were out of order. A survey of 71 handpump communities in West Java in 1989 found only 1 where the pumps were in good condition. The remainder were "half functioning." It is unclear whether this meant that half of the pumps

in a village were operating or that the pumps were only half operational. In either case, it was clear that handpumps were not being maintained, and accordingly, CARE has largely ceased providing them.

The small sample of diesel, hydraulic ram, handpump, and rainwater catchment sites visited was insufficient to provide a broader picture of operational status by technology. In fact, CARE has not installed many diesel systems or hydraulic rams, and has introduced rainwater catchment in limited areas in East Java. However, more than 140 villages, or roughly 40 percent of villages assisted by CARE, were equipped with handpumps during the nearly 10-year period of interest.

5 Factors Affecting Sustainability

A series of questions were posed in order to determine the importance of various factors, as described in Volume I of this report, to sustainability. The questions are grouped under the following categories: institutions, development processes, technologies, projects, donors, and contexts.

5.1 Institutions

Do national agency actions manifest a long-term commitment to project goals?

There is a commitment to sectoral goals, although it is unclear what long-term commitment or government role there is in specific project goals. The Government of Indonesia has formulated a series of five-year development plans, of which the current plan (1989-90 to 1993-94) is the fifth. Earlier plans have focused on infrastructure rehabilitation and agricultural self-sufficiency, and more recently on alleviation of poverty and the equitable distribution of the benefits of growth. The government did not achieve the International Drinking Water and Sanitation Decade goals of 60 percent coverage in rural areas, principally because of the magnitude of the task; limited domestic and donor resources; complex and overly centralized planning, coordination, and implementation procedures; and the continued bias favoring larger cities and towns. There is a growing awareness of the need for greater community and local government involvement in rural water supply, but this has not yet led to any action. The Water Supply and Sanitation Project for Low Income Communities, a World Bank-funded program, is struggling with this issue now.

Is there a national policy statement that clearly defines the respective responsibilities of the government, the community, and the private sector, including financing mechanisms, equipment standardization, and arrangements for providing spare parts?

Other than broad objectives and general sectoral policies outlining the roles of government agencies, there are no clear statements defining the division of responsibilities between the

government and communities on issues such as financing, equipment standardization, and system ownership. The contributions of donors and international NGOs are appreciated, and apart from being required to coordinate their activities with the government, these organizations are given considerable latitude in addressing the water and sanitation needs of rural populations.

Do regional agencies have work plans for extension activities that include reinforcing health education messages and periodic (semiannual at least) monitoring of community activities?

Provincial governments have considerable autonomy in carrying out national policy. Provincial and district planning boards coordinate rural water sector activities under the jurisdiction of the health, public works, regional development, and local development departments, and also donor projects. The public works department is responsible for design and construction supervision, the health department for health education, and the regional or local development departments for general development. Donor projects may rely on some government assistance. While plans and budgets for extension exist, it is difficult to ascertain whether they are carried out fully.

Are community WS&S committees or key individuals confident of managing the facilities and related activities?

Water committees and key individuals view themselves as able to meet all of the demands of gravity water supply systems. CARE assisted by providing water system designs and by helping to organize communities to contribute to construction and eventual O&M. CARE trained technicians (usually more than one) in every village it assisted. The communities clearly see themselves as responsible for all system maintenance and repair, and feel free to modify designs and add public and private connections (more than 60 percent of communities visited had added public taps or standpipes to their systems). Communities have independently mobilized the labor, materials, and capital needed for repairs, including main pipeline breaks and repairs to the spring. The formation and training of water committees were not part of CARE's strategy until 1986. Few communities have water committees that actively manage supplies. Committees exist largely in name only and mobilize only when the situation demands it. Only 20 percent of villages have active water committees.

Communities with handpumps manage their systems through user groups rather than village committees, a style that has developed spontaneously even where water committees were introduced. These user groups are not confident about taking responsibility for maintenance and repair, and expressed concerns about the availability and cost of spare parts. The pump most widely used is the shallow well Bandung pump, manufactured in Indonesia but no longer produced except when large orders are placed. In some places, user groups have gone to great lengths to keep pumps operating. In others, particularly where there are alternative sources like dug wells, for instance, older pumps have fallen into disrepair.

Are users satisfied with the service provided and content to see no changes?

Users generally are satisfied with their systems, although some complained about reduced service during the dry season, the absence of house connections, and water shortages in some public facilities, which are often exacerbated by community additions to the system.

Are more women serving on WS&S committees and participating in activities than when the project began?

CARE now strives to involve women in decision-making and O&M, but there are very few women involved in the management of systems that are more than five years old. Less than 5 percent of the people interviewed were women active in water committees.

Are trained mechanics available to maintain and repair the facilities?

Mechanics continue to be available within communities to maintain and repair water supply systems. As part of the assistance CARE provided, mechanics were trained in all communities. In most villages, these technicians continue to be recognized for their special skills. They are called upon to make repairs and in many cases are paid an honorarium for their services. In several cases, these technicians have relocated but have themselves trained replacements. On several occasions we were told that technicians from one village have been able to assist members of another nearby community with their water supply needs.

Is there an importer or manufacturer of spare parts and a system for distributing them?

The private sector is involved in supplying spare parts. Most spares for gravity-fed systems (taps, cement, pipes, and fittings) are available in subdistrict towns an hour or so from most villages. Some larger pipe fittings (4-inch galvanized unions and elbows, for instance) are harder to find. Bandung handpump spares generally are unavailable, but parts for the Dragon handpump are obtainable.

5.2 Development Processes

Did design documents spell out sustainability as an objective to be attained?

CARE's early projects in the 1970s made no reference to sustainability, although they included villagers in construction and trained technicians in maintenance and repair. More recent projects state the need to establish sustainable mechanisms for O&M of completed facilities and have turned attention to establishing water committees and providing them with technical, financial, and management skills. But greater skills have not necessarily engendered the will to actively manage.

Did communities provide inputs into problem identification and project design?

In the early projects, communities were required to provide labor and local materials and were consulted about tap locations and general system layout, but designs were based on users per tap or handpump, walking distance, and head losses. Over the years, CARE has learned the virtues of greater community management and all project decision making. Projects now prepare communities to make almost all decisions about the level of service and how to mobilize capital, leaving CARE to make only such technical choices as pipe sizing and capture design.

Was a baseline survey carried out to verify project assumptions and obtain information on knowledge, attitudes, and practices related to WS&S?

No baseline surveys were carried out for earlier projects. Baseline surveys are a recent innovation, used for the most part to rationalize the site selection process. None of the surveys of completed systems has concentrated on knowledge, attitudes, and practices, although they have yielded much useful information on quantifiable indicators such as spring yield and population served.

Did the participation processes include the empowerment of communities so that their opinions were considered throughout the project cycle?

The participation process has been a major component of all CARE-assisted projects and there has been an increased focus placed on community responsibility over the years. Early project approach focused largely on technical matters related to construction. As CARE gained experience, the focus shifted to technical and financial management of O&M. Now the approach is clearly designed to empower villagers to make all decisions themselves (in some cases even if this goes against the better judgment of CARE staff). This approach is termed "Community Management" to distinguish it from "Community Participation."

Do community members (WSS committees) participate in O&M management and financial decisions?

Communities accept and understand their full responsibility for O&M management and financial decision-making. In line with the goal of the CARE projects, there are a few cases where management and decision-making take place within a formally constituted and representative water committee. However, more often management is conducted in an authoritarian manner by a small group or even one person. Sometimes a larger group of users makes decisions in what it feels are the best interests of the community. Financial management in many cases consists of raising funds when repairs are needed. For the most part the government does not interfere in management of rural water systems unless asked.

Is there evidence of positive behaviors related to improved hygiene (such as proper storage of water, use of soap, and clean latrines)?

In some areas there is evidence of behavioral changes. Latrines are clean, small pieces of soap attest to its use, and water containers are rinsed. Water is boiled in some communities and in others, water for drinking is segregated from water used for other purposes. This evidence is not universal. Improvement of health was a clearly stated goal of early CARE projects, but was not explicitly stated as a primary goal in more recent ones. Project health education approaches have changed over the years from training health workers to depending on the provincial health department to deliver health education and hygiene messages. Without reference to pre-project conditions, it is difficult to tell what behavior changes are attributable to project activities. However, the general indifference to proper drainage around water points, the lack of covers on storage tanks, and poor maintenance and repair of pipe networks suggests that project-focused health education has not been very effective.

Is there demonstrated knowledge of the causes of diarrhea and other water-related diseases and ORS preparation?

Although not everyone was aware of the causes of diarrhea, there was a general understanding that "dirty water" causes illness. The widespread lack of latrines and latrine use suggests that even if people understand the causes of diarrhea, there has been little behavioral change. This appears to be more true in remoter areas. Latrine use is higher on Java. In some villages latrines (if they were built) are not used at all. Many people continue to defecate in the river and although they may not drink water from the river, they continue to bathe and wash clothes in it.

Do communities receive information about WS&S through the media or extension agents?

There are several major sources for WS&S information. These include the CARE field officers who are responsible for assisting communities with meeting water supply and sanitation needs and the sub-district health worker (sanitarian). The CARE field officer is responsible for providing information and training about water supply system O&M and financing. He or she is not directly tasked with providing health and sanitation information. However, field officers are knowledgeable and do provide information informally as part of their job in assisting communities to mobilize and organize. Health education is now formally the responsibility of the provincial health department and their sub-district representatives at health centers (a doctor and a sanitarian).

Do WS&S committees have adequate communication channels with government agencies and the private sector to express community needs?

Communities are generally self-reliant and fall outside government communication channels. The private sector provides spare parts and expertise as necessary in most cases. The

exceptions are hydraulic rams and Bandung handpumps (which are no longer manufactured). Although the private sector can provide spares and expertise for diesel system maintenance and repair, cost and proximity are constraints. Communities do have and have used formal government administrative channels through the elected or appointed head of the village to the sub-district, district, or even provincial governments to express grievances, solicit technical assistance, or provide authority and legitimacy to local system management.

Did the project design specify the responsibilities of the community, government agencies, and private sector and describe the financing mechanisms for O&M?

Project documents do not spell out O&M responsibilities, and no formal handover procedures exist. However, the fact that communities provide significant contributions to construction (in cash and labor) leads them to understand and accept all management, financing, and technical problems upon completion of a project. As part of CARE's program, all CARE field officers explain that the communities will be expected to maintain and repair their water supply systems on their own.

Are O&M roles clearly defined and understood by all responsible parties?

There is no question that communities understand and accept their O&M roles and that they cannot count on government assistance. Early projects tended to focus on community acceptance of O&M roles with less training in operational management and financing. Today's projects emphasize financial and operational management and provide specific training in such areas as how to elect committee members, how to record fee payment, etc.

Is the ownership of WS&S facilities clearly defined?

Communities feel a complete sense of ownership even though in most cases ownership is not legally clear. CARE takes pains to make communities feel the responsibility of ownership by involving them in system design decision-making and by expecting them to make significant cash and labor contributions to construction. Legal ownership is least clear when provincial governments have also made contributions to construction. In most cases, legal ownership does not appear to be an issue.

Do the responsible parties (communities or government agencies) have the resources to cover recurring O&M costs?

Only in a few cases have communities appealed to CARE for assistance. Generally they can collect the money for major repairs of piped water systems, but funds for minor repairs to stop leaks or replace broken or faulty taps are more difficult to collect because these problems do not interrupt the water supply. In only about 30 percent of visited sites were fees collected regularly, confirming the general complaint that fee collection is a major problem except when a special need arises. There were no handpump user groups that collected regular fees, all of

them relying instead on special collections like most of the communities with piped water. Since handpumps are designed for an average of 100 users per pump (only about 20 households), mobilizing funds for large repairs is more difficult.

Has the project been monitored to verify that important benchmarks of progress, such as the items in this list of questions, have been met? (The baseline survey is an important tool in determining benchmarks.)

Several surveys of past projects have been completed, most notably a technical evaluation of the RCWS project in 1984, a survey of West Java sites in 1987, and a survey of all gravity-fed water supply projects in 1990. These tended to evaluate sustainability in terms of operational status alone.

Did communities take part in the evaluation design and the review of conclusions as a means of indicating whether they were satisfied with project benefits?

Field officers are required to monitor construction to ensure that standards are maintained and that work progresses satisfactorily. In the early period, say before 1984, they did this with directive authority. Now they act more as teachers or facilitators. In general, they remain available to the communities in which they once worked and ready to offer advice on technical matters when it is sought. In this way CARE can monitor past projects and the communities informally take part in project evaluation by providing feedback to field officers and CARE management staff. However, this is not done formally or systematically

5.3 Technologies

Were selected technologies the most appropriate in terms of affordability and the level of service desired?

For the most part, CARE has provided gravity-fed piped water systems and has installed handpumps (both shallow- and deep-well) in NTB and West Java only where gravity-fed systems were infeasible. It has constructed rainwater catchment tanks in about 23 communities in East Java. Hydraulic rams and diesel pumps were considered technologies of last resort and were rarely used. In general, the technologies chosen were the best in terms of cost and maintenance. Piped systems are easy to understand, simple to repair, and inexpensive to maintain. Earlier experiments with flow restrictors and valves to ensure equitable distribution have given way to distribution tanks that divide the flow among several communities and reservoirs. This minimizes tampering, guarantees equitable distribution, and reduces conflicts over water. As a result of both community interest (expressed as far back as 1983) and a belief that sanitation will be improved, there is a move towards designing with house connections in mind. Sand filters introduced where stream sources are used had been bypassed in half the sites visited.

The use of shallow-well handpumps could be questioned on the grounds that dug wells would have sufficed and been cheaper to operate and maintain. However, the thinking in the late 1970s and early 1980s was that a suitable handpump could be easily managed and would afford a more protected source of water than a dug well. This view is still held by many sector experts. However, the abandonment of poorly performing or broken handpumps for traditional water sources suggests that the idea does not work in Indonesia. The reasonable assumption that a locally manufactured pump would ensure easy repairs and parts replacement has proved false (the local company stopped making them). The management system that relies on a small group of users makes repair more burdensome for individual households. These lessons have not been ignored and, with a few exceptions, CARE has not installed new handpumps for the past five years.

Rainwater catchment tanks to help households reduce their dependence on expensive trucked water supplies and get through the dry season have been a success in some communities in East Java. Success seems to depend on the genuine need of the community and the existence of a loan fund for construction. Diesel systems have been introduced in only a few instances because the attendant technical, management, and financing problems were sufficient to deter widespread use. Similarly, hydraulic rams have been used sparingly in some small villages. They require an explanation of the limited quantity of water that can be expected and need regular maintenance.

5.4 Projects

Was the project managed within the existing institutional structure to facilitate continuation of activities after it ended or was a special project organization created?

Although CARE has implemented its projects largely outside the institutional structure responsible for rural water supplies, it has been successful in winning government support and financial contributions. The arrangement has given CARE a degree of freedom not otherwise possible, but it has limited CARE's impact on sector policy and the opportunities for contributing to the broader policy dialogue. This is evident as the government struggles with including a participatory component in its own Water and Sanitation Program for Low Income Communities.

Were at least 15 percent of project resources spent on institution-building activities, including the building of a training capacity?

Training has always been an important element of the CARE program, accounting for much of the work of field officers from the beginning. CARE has also spent considerable effort on staff development. However, it is difficult to determine from the budget line items what percentage of project resources has been spent on training over the years.

Was there evidence of flexibility in adapting to problems related to sustainability during the course of implementation?

That the program has been flexible and has been given much freedom by donors is evident from the consolidation of technical designs in the early 1980s and subsequent improvements, the move from community participation to community management, and the willingness to test community self-financing.

5.5 Donors

Has there been continuing donor interest prior to and during project implementation in sustainability and the eventual transition to post-project status?

The donors in CARE's water program are CIDA for the Sulawesi projects and USAID for the others. The CIDA projects are target-oriented and focus on health and gender issues, and the USAID projects emphasize self-financing and the needs defined by each community. Both donors have supported initiatives arising from project experience, and both are encouraging involvement in policy dialogue and greater participation of local NGOs while planning for program phaseout.

5.6 Contexts

Have there been any contextual factors since the project was completed that have adversely affected the benefit stream (e.g., droughts, high inflation rates, political upheavals)?

CARE has adapted to the varying physical conditions, cultural factors, and economic levels in the provinces in which it works. Apart from rising inflation and economic consolidation in the country as a whole, contextual changes have had little impact on the rural water sector.

6 Conclusions

6.1 Piped Water Systems

The benefits of CARE's gravity piped water systems have been sustained even without active water system management in many communities. It is evident that

- Water sources being used are delivering at least 60 liters per capita per day in the design year (15 years after construction)
- Construction is simple and rugged and facilities are well built

- Communities value improved access to adequate water supplies
- Community involvement in construction has produced technicians with the skills required to repair breakdowns
- Communities are aware of their sole responsibility for system O&M.

The first two factors minimize the need for active water management committees, while the other three ensure that communities can mobilize resources and make repairs when necessary. Almost universally, communities value their systems for giving them access to more water and not at all for what these systems can do to improve health. However, better health directly attributable to increased water usage is likely to follow anyway. It is also clear that the communities and CARE have very different ideas about the maintenance of water systems. Minor problems are given scant attention but major breakdowns are attended to immediately.

6.2 Handpumps

In general, the benefits provided by shallow-well handpump systems have not been sustained for the following reasons:

- People do not sufficiently value the clean water that handpumps provide when they have alternative sources like streams and dug wells to turn to
- Spare parts are not readily available even though the pumps were manufactured in Indonesia
- The informal system of management by isolated user groups is not equal to the logistical and financial complexities of maintenance and repair.

6.3 Other Pumping Systems

The success with which other technologies have been sustained was not explored in detail. However, from observations of several cases and discussions with CARE staff, government officials, and others, it is apparent that sustainability is harder to achieve as technical complexity increases (as with diesel systems) and when user populations are large (as with systems serving more than one village). CARE has tried to deal with these issues on a case by case basis, and has not developed broad strategies that could be successful on a national scale.



Water-rich landscape in the Tana Toraja region of south Sulawesi



Standpipe from gravity spring



Building a water storage tank using CARE
project skills and self-financing.



Old Dragon pump installed in early 1980s in Renauae
and kept operational by local artisan methods.



Community leader in Penanae demonstrating the operational status of a Bandug handpump repaired by the local blacksmith.



Wasting water while washing clothes
is a common practice.

PERSONS INTERVIEWED IN INDONESIA

Jakarta - CARE International Indonesia (CII) Headquarters

Paul McCarthy	CARE Country Director
Dan O'Brien	Deputy Director
Budi Rahardjo	Project Coordinator CSFW
Catharina Haryono	Assistant Project Coordinator CSFW
Fauzi Hamzah	Assistant Project Coordinator CSFW
John Scoggan	Project Coordinator SRCD
Glen Gibney	Coordinator MIS Unit
Hanna Tobing	Monitoring and Evaluation Section
Nasihin Hasan	
Ignas Sebayang	

CII - South Sulawesi Office

Jopie Sinanu	Chief Representative
Totok Hartono	Assistant Chief Representative
Sartono	Project Manager
Yohannes Djide	Project Officer
Jonny Nanna	Project Officer
Moch. Dachlan	Field Officer
Rosdiana Munir	Field Officer
Nurtang Gani	Field Officer

CII - South East Sulawesi

Adjie Setioprodjo	Chief Representative
Rochmat Djatmiko	Assistant CARE Representative
Rineke Rolos	Project Officer
Latief	Field Officer
Aris Buhari	FO-Dryland Farming Systems (DFS)
Yusuf Iskandar	Field Officer

CII- Central Sulawesi Office

Irfani Darma	Chief Representative
Johnny Thomas	Project Manager
Amien Mohamed	Project Officer-Water Supply
Valentina Parantean	Project Officer-Water Supply

Yatrin Kanlu	Project Officer-Credit
I Gede Wayan Santosa	Project Officer-DFS
Herawanto Bagiono	Field Officer
Abdul Karim Naser	Field Officer
Usman Djanati	Field Officer
Eri Pongtengko	Field Officer
Sukmawati	Field Officer-DFS
Yustinus Wuri	Field Officer-DFS

CII - Nusa Tenggara Barat, Mataram Field Office

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Rachmat Suhandia	Project Manager
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Salikin	Field Officer
Husni Mansyur	Field Officer
Rohliyanah	Field Officer
Suraya	Field Officer

CII - East Java, Pacitan Office

Nugroho Tomo	Chief Representative
Purwiyanto	Project Officer
Harry C.	Project Officer
Y.F. Sumaryani	Field Officer
Siwi Rochani	Field Officer
Agus Samsulhadi	Field Officer
Setiyarni	Field Officer
Hapsoro	Field Officer
Bambang S.	Field Officer
Syaid	Field Officer
Lilik Hidayati	Field Officer
Sunarso	Field Officer

Yayasan Setleabudi Utama Foundation (YASBU, an NGO formed by ex-CARE staff, Bandung East Java

Joko Siswanto	Program Director
Ikin Sodikin	Executive Director
Kosasih P.	Office Support Director
Dana Sasita	Field Officer
Wawan Gunawan	Field Officer
Edi Sofiandi	Field Officer

Government Officials

Akhmad Dakari	BAPPEDA Muna (SES), Chair
Jafar Ombi	BAPPEDA Muna (SES), Development Section
Drs. Muhammad Yusuf	Muna District (SES) Secretary
Mr. Purba	Administration Officer, BPAB/PDAM Raha (SES)
Mr. Syamsul Hurich	PDAM Dompou (NTB)
Drs. Husni Ilyas	PDAM Dompou (NTB)

Other Organizations

Mulyanto	Deputy Director-Save the Children Foundation
Zulkarnain	Putra Nusantara Foundation
Richard Pollard	UNDP/World Bank
Muhammad Yahiya	UNDP/World Bank
Alfred Lambertus	UNDP/World Bank
Richard McGowan	World Bank Project Manager
Hildi Haiplik	Health Educator-World Bank Project
Alan Smith	Team Leader-NTB Environmental Sanitation & Water Supply Project
Makoto Morooka	JICA
Ira Nastiti	Technical Officer WSTCF

Also interviewed village leaders, water committee members, technicians, and other community members in the villages visited.

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