BY THE U.S. GENERAL ACCOUNTING OFFICE

Report To The Administrator, Agency For International Development

Meeting A Basic Human Need: AID'S Rural Potable Water And Sanitation Program

Unsafe water and inadequate sanitation spread fatal and debilitating diseases which affect millions of lives in the developing world. The United States has been concerned with this problem for over 40 years. Between fiscal years 1978 and 1982, AID provided over $161 million in Development Assistance for directly meeting the need for these services, mainly in rural areas.

AID has been successful in expanding access to improved water and better sanitation. GAO notes problems, however, with delivering the full range of the intended facilities and services and implementing operation and maintenance activities which are critical to long-term success. Also, AID is not identifying the immediate benefits derived from the projects.

GAO makes recommendations for improving implementation, ensuring that the projects receive proper upkeep, and identifying the improvements resulting from this type of assistance. AID has steps underway or planned which should implement GAO's recommendations.

GAO/NSIAD-84-34
FEBRUARY 21, 1984

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WASHINGTON, D.C. 20548

NATIONAL SECURITY AND
INTERNATIONAL AFFAIRS DIVISION

B-211720

The Honorable M. Peter McPherson
Administrator, Agency for
International Development

Dear Mr. McPherson:

This report presents the results of our review of AID's potable water and sanitation activities in Ecuador, Indonesia, Malawi, Peru and Tanzania.

The report contains recommendations to you on pages 23, 34, and 43. As you know, 31 U.S.C. §720 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the House Committee on Government Operations and the Senate Committee on Governmental Affairs not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of the report to the Director, Office of Management and Budget, and to appropriate congressional committees.

Sincerely yours,

Frank C. Conahan

Frank C. Conahan
Director

U.S. GENERAL ACCOUNTING OFFICE
REPORT TO THE ADMINISTRATOR,
AGENCY FOR INTERNATIONAL
DEVELOPMENT

MEETING A BASIC HUMAN NEED: AID'S RURAL POTABLE WATER AND SANITATION PROGRAM

D I G E S T

Water is a basic human need. Only about one-fourth of the people in the rural areas of developing countries, however, have access to safe, adequate supplies. Fewer live in a sanitary environment. As a result, numerous diseases affect millions of lives. (See pp. 1 and 2.)

The Agency for International Development (AID) is the principal U.S. agency providing assistance for water and sanitation activities overseas. Between fiscal years 1978 and 1982, AID provided over $161 million in Development Assistance for this purpose, mostly for projects in rural areas. Other funds support larger municipal systems, and provide these services to housing projects. (See pp. 4 through 6.)

GAO made this review because of the (1) worldwide area in which this type of project is being implemented, (2) vast number of people who need these services, (3) humanitarian aim of the assistance, and (4) relationship between safe water, adequate sanitation and improved health.

GAO examined the extent U.S. assistance is reaching the rural poor, operation and maintenance activities are ensuring the continued flow of benefits, and needed improvements are being identified. GAO believes the issues discussed in this report reflect the progress and difficulties AID is experiencing in helping to meet this basic human need. Although the problems cannot be portrayed in a statistical sense, they do illustrate the typical impediments to delivering this type of assistance. (See pp. 6 through 8.)

PROBLEMS MEETING A BASIC NEED

Many factors affect the timely delivery of water and sanitation services. According to

the World Bank, low host country priority, inadequate financial support, and cumbersome logistics are among the problems contributing to the slow progress. GAO found these difficulties in 3 of 5 countries visited during the review. The most prevalent problems were competing host country priorities which may result in inadequate institutions or personnel to implement the programs and install the facilities. As a result, not all the planned benefits reach the target populations. (See ch. 2.) For example:

--In Indonesia, only about 2,500 of 13,000 yard hydrants, and 130 of 200 public taps (intended to serve the very poor) were installed near the completion of the Surakarta Potable Water Project because of procurement and delivery problems and bureaucratic delays. (See pp. 16 and 17.)

--In Peru, only 30 of 100 planned water systems were installed or under construction at the time of our review of the Rural Water Systems and Environmental Sanitation Project--2-1/2 years after it was approved. Major reasons for the slow progress were limited host country institutional support, inadequate personnel, and the slow procurement and delivery of material. (See pp. 17 through 19.)

--In Tanzania, only 33 of 139 planned wells, 2 of 14 planned boreholes, none of 14 planned water catchments, and only 1 of 3 planned construction crews were provided through the Arusha Planning and Village Development Project. Funds were shifted to another component of this multi-purpose project. Two other "drought-relief" projects were not providing any water more than 1-1/2 years after approval. The problems stemmed from procurement delays, and lack of personnel or equipment to install the systems. (See pp. 19 through 21.)

Based on GAO's review of projects in 5 countries, AID has been successful where there has been a host country commitment and community participation. Projects in Ecuador and Malawi were being implemented nearly in accordance with the plans. The project in Ecuador benefited from the assignment of a full-time

engineer. In Malawi, the project serves as an example of what can be accomplished through the combination of a host government commitment, community self-help, and donor support. (See pp. 11 through 15.)

DIFFICULTIES ENSURING CONTINUED SERVICE

Proper operation and maintenance is critical to the long-term success of the projects. These measures are essential to the continued delivery of service. Effective operation and maintenance activities require (1) financial support to meet recurring costs, (2) trained personnel to perform the repairs, and (3) user health education to promote proper utilization and upkeep. (See ch. 3.)

Financial support is a particularly troublesome but essential element. For example, in Indonesia, operational and administrative problems are hindering the full collection of user fees, and preventing the system from gaining financial integrity. In Peru, user fees were not being collected, or were not adequate to provide needed repairs. In Tanzania, where the collection of fees is not a traditional practice, the government also lacks the resources to support an effective operation and maintenance program. (See pp. 26 and 27.)

Operation and maintenance is often a pyramid of activities. National, regional or district personnel are intended as a source of institutional support and technical advice. They also perform major repairs. The day-to-day operation and minor repairs are a community responsibility. GAO found cases where personnel are not being appointed or provided to accomplish these tasks, or training is not being accomplished as planned. Also, limited institutional support is precluding the timely correction of problems beyond the capacity of the villagers. (See pp. 29 and 30.)

Health education informs the users of the relationship between safe water, proper sanitation and improved health, thereby fostering maintenance of the systems. GAO found that

limited emphasis on this type of activity can contribute to misuse or disrepair of facilities. The design report on the Rural Water Systems and Environmental Sanitation Project in Peru attributed the misuse and underutilization of existing facilities to the lack of health education for the intended users. The misuse of sanitation facilities installed through the Surakarta Potable Water Project was also attributed to the lack of such a program. Systems which are designed to improve the quality, quantity, reliability and convenience of water over the traditional source of supply may also result in better upkeep. (See pp. 30 and 31.)

GAO recently reviewed the operation and maintenance of U.S.-supported irrigation projects (GAO/NSIAD-83-81). The report notes many of the same management problems which hinder the proper upkeep of potable water and sanitation facilities. The digest of the report is reproduced as appendix I.

IMPROVEMENTS ARE NOT BEING MEASURED

GAO found little information concerning the improvements in the water being provided through U.S. assistance. Although the quality and quantity of the water appears to be better than the traditional sources of supply, the lack of laboratory facilities and logistical constraints preclude routine oversight. For example, biological quality, an important indicator of an immediate health hazard, is generally unknown. AID provides funds for portable test equipment, but none were procured for the projects GAO visited. The World Health Organization (WHO) recommends that sanitary surveys be used as a minimum level of surveillance in remote areas. None of the projects GAO reviewed were conducting the type of survey recommended by WHO. (See pp. 35 through 39.)

Most of the water supply projects reviewed by GAO rely on improved health as a measure of success. This cause and effect relationship is difficult to quantify, because of the many factors which affect health in developing countries. As a result, the World Bank and private researchers have suggested that evaluations focus on the immediate and identifiable

changes in the quality, quantity, reliability and convenience of the water as means to better health and indicators of success. GAO agrees with this suggestion. (See pp. 39 through 42.)

CONCLUSIONS

GAO believes that overly optimistic implementation schedules, and scopes of activity which overtax the resources of the host country result in projects which do not deliver the planned level of benefits. Common obstacles to timely progress and those activities which have contributed to past successes should, therefore, be fully considered in the project designs. The scope of activities should also reflect what can reasonably be accomplished during implementation.

GAO also believes that the continued operation and maintenance of the systems is as important as the installation of the facilities. Proper upkeep deserves more attention during the early phases of the implementation process. In addition, GAO believes that AID can do more to ensure the sanitary quality of the water provided through the projects by identifying and preventing the immediate health hazards. Also, AID is not focusing on identifying the immediate, measurable benefits which are the necessary links to improved health--better quality, quantity, reliability and convenience of the water. (See pp. 21 through 23, 32 through 34, and 42 and 43.)

RECOMMENDATIONS

GAO recommends that the Administrator, AID, direct that project proposals, designs and implementation schedules objectively assess and reflect the

--resolve and ability of the host countries to implement and manage the projects,

--willingness of the target communities to participate in installation activities,

--common impediments to the timely delivery of the facilities and how they will be overcome, and

--activities and services which can be accomplished and delivered during the project life.

GAO also recommends that operation and maintenance be given the same priority as installation of the facilities by implementing upkeep activities in tandem with construction. This component should provide (1) adequate resources to meet recurring cost, (2) trained personnel to ensure the continued delivery of service, and (3) health education to promote proper upkeep.

In addition, GAO recommends that AID use portable test equipment and sanitary surveys to identify changes in the quality, quantity, reliability and convenience of the improved supplies of water. Project goals and evaluations should emphasize the importance of identifying these improvements as means to better health, and measures of success. (See pp. 23, 34, and 43.)

AGENCY COMMENTS

AID stated that GAO's observations are, in general, consistent with the Agency's experience, that this report provides a comprehensive list of implementation problems and that it offers good guidelines for the water and sanitation subsector. They concurred with the GAO conclusions and recommendations. GAO was informed of several steps now underway or planned which, if acted upon, would meet the intent of the recommendations. (See pp. 23 and 24, 34, 43 and 44, and app. II.)

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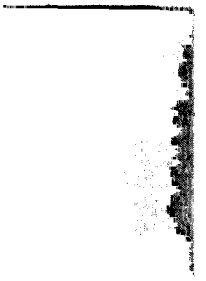
ABBREVIATIONS

AID	Agency for International Development
GAO	General Accounting Office
IDB	Inter-American Development Bank
OPG	Operational Program Grant
PVO	Private Voluntary Organization
WASH	Water and Sanitation for Health
WHO	World Health Organization



A hand-dug well--the traditional source of water for many people in developing countries.

CHAPTER 1

INTRODUCTION

The World Health Organization (WHO) estimates that less than one-fourth of the people in the developing world have convenient access to adequate supplies of safe water and sanitation,[1] and such conditions spread diseases which claim thousands of lives, mostly children, every day. Many other victims cannot achieve fully productive lives because of poor health.

The United Nations, recognizing this fundamental need, declared the period 1981-1990 the International Drinking Water Supply and Sanitation Decade. The organization established a goal to provide adequate, clean, convenient and reliable water and sanitation for all people by 1990. According to WHO, such an achievement would mean infant deaths could be reduced by half; the role of women, the traditional bearers of water in many countries, could be improved; and the economic status of the poorest people in the developing world could be advanced.

Despite a history of support and interest by both the developing countries and the donor community, such problems as poor management, lack of supporting institutions, implementation delays, equipment breakdowns, inappropriate technologies, inability of host countries or project beneficiaries to meet the recurring costs of operating and maintaining the systems, and other impediments hamper such projects. Often, the systems become inoperable, people return to their traditional source of water, and the quality of life declines to previous levels.

The Agency for International Development (AID) now serves as the principal U.S. agency funding such projects in many developing countries. This report examines the extent (1) U.S. assistance reaches the intended beneficiaries, (2) problems are being overcome, and (3) improvements in the quality and quantity of water are being measured.

WATER: THE TRANSMITTER OF DISEASE

Numerous diseases are linked to contaminated or inadequate water and unsanitary living conditions. WHO says about 80 percent of all diseases are water-related and that these claim almost 25,000 lives every day. WHO also says that in the developing world, half the deaths of children under 5 years of age result from diseases spread by unsafe or inadequate water and filth.

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[1]WHO statistics concerning access to adequate supplies of safe water and sanitation cited here and elsewhere in this report do not include the People's Republic of China.

Water-related diseases are commonly categorized as "water-borne," "water-based," and "water-hygiene." Water-borne diseases result from consuming contaminated supplies. Water-based diseases result from mere contact with water containing parasites. Water-hygiene diseases result where there are inadequate quantities for personal and domestic hygiene. Diarrheal illnesses, which are primarily water-borne, are especially serious because of the high morbidity and mortality they inflict on infants and children. World-wide, children under 5 years old experience about 500 million episodes each year and 6 million die from this disease. According to WHO, Schistosomiasis, which is a water-based disease transmitted by snails, infects 200 million people and between 600 and 800 million people are at risk to infection. Water-hygiene diseases include skin and eye infections spread by insects which thrive in an unsanitary environment. Trachoma is in this group and the leading cause of preventable loss of vision and blindness. WHO estimates that between 400 and 500 million people are afflicted, 2 million are blind and 8 million are at risk to blindness.

THE GAP BETWEEN SUPPLY AND DEMAND

According to WHO, the rural poor in developing countries are the most seriously affected by the lack of access to safe and adequate water. In 1970, only about 14 percent of this group had access to safe water. By 1980, the situation had improved to about 30 percent. Despite this increase, the number of people without access to safe water remained the same--about 1.1 billion--because of population growth.

Historically, urban dwellers have had better access to adequate and safe water. Within these areas, however, are large groups of low-income people living in slums, squatter settlements and peri-urban communities without such services. The situation is growing more serious according to WHO, because of high birth rates and increasing migration from rural areas. In 1970, almost 67 percent of the urban population had access to adequate and safe water. By 1980, this increased to almost 75 percent. As of 1980, about 167 million urban dwellers lacked such service.

U.S. INVOLVEMENT IN WATER AND SANITATION ACTIVITIES

The United States endorsement of the Water Supply and Sanitation Decade is another part of an over 40-year involvement in these types of activities. Primary emphasis has shifted between technical assistance to countries which do not have the capability to implement such projects and capital assistance to fund construction or rehabilitation of water and sanitation facilities. The emphasis now is on technical assistance--reflecting both funding constraints and a renewed interest in institution building.

Components of the AID program

AID supports a wide-range of water and sanitation activities. These include

--technical assistance for planning water use and management;

--training of local personnel to design, operate and maintain the systems;

--health education to improve hygiene and environmental sanitation practices;

--construction or rehabilitation of facilities;

--new approaches to providing low-cost services; and

--local manufacture of equipment and spare parts using indigenous material.

These activities include specific projects intended to directly meet a water-related need, or are components of broader development efforts aimed, in part, at improving the social or economic conditions of a target population.

Recent AID policy and project design standards

In May 1982, the Agency issued guidelines concerning the use of funds for domestic water supply and sanitation programs. There must be evidence of a need and demand for such services. Evidence of a need for the systems include the

--high prevalence of disease caused by insufficient water,

--consumption of contaminated water, or

--use of inadequate or inappropriate sanitation facilities.

A demand exists where the beneficiaries express a willingness to finance the recurring operation and maintenance costs, and part of the capital cost. In cases where a true need exists, but an expressed demand for the improvements is lacking, the host government must make a commitment to meet (1) a substantial portion of the investment, and (2) the initial recurring costs until the beneficiaries can assume responsibility for the needed systems. Local or national institutions must have the resources to implement and operate the systems, or require minimal external assistance. The systems must also be accessible to

ensure continued operation, or the beneficiaries must be able to operate and maintain the facilities without outside help.

Also, the design of the systems should provide for

--a daily minimum of 20 to 40 liters of safe water for each beneficiary to ensure sustained improved health;

--improved water quality if it can be achieved at a reasonable cost and not jeopardize reliability;

--appropriate, culturally acceptable technology;

--community involvement;

--health education to promote proper water use and personal hygiene;

--sound institutions which can provide financial management to ensure long-term viability; and

--training for proper management, operation and maintenance.

AID encourages integrating the systems with other projects.

The guidelines can be useful in prioritizing water and sanitation project proposals, and facilitating the allocation of scarce foreign assistance resources. If applied in a prudent and consistent manner, they should also preclude the commitment of resources to projects which do not merit support from the United States.

U.S. SUPPORT OF RURAL WATER SUPPLY AND SANITATION ACTIVITIES

Direct U.S. support of water supply and sanitation activities is primarily funded from the (1) Development Assistance functional accounts, and (2) Economic Support Fund. Development Assistance loans and grants finance projects in rural areas. Also in this category are centrally funded technical assistance for training and the design and management of the systems. Economic Support Funds are used mainly for urban projects,

mostly in the Near East. The following table indicates the level of support over recent years.

DEVELOPMENT ASSISTANCE AND ECONOMIC SUPPORT FUNDING FOR WATER AND SANITATION [a]

Fiscal Year	Development Assistance	Economic Support Fund	Total
	(in millions)		
1978	$ 15.0	$166.5	$ 181.5
1979	23.5	192.1	215.6
1980	48.2	139.5	187.7
1981	45.3	237.9	283.2
1982	29.2	163.0	192.2
Total	$161.2	$899.0	$1,060.2

[a]Does not include support for water and sanitation activities which are components of other types of projects such as primary health care; rural, regional and selected development; and disaster assistance.

Until the early 1970s, Latin American countries were the focus of Development Assistance, although projects were also being implemented in Africa and Asia. Now, Africa has more projects which are of a relatively small size.

The United States also supports water and sanitation services as a component of the Housing Guarantee Program. Between fiscal years 1978 and 1982, AID guaranteed about $51.7 million a year in private-sector loans to finance these services as part of low-cost shelter programs. Private voluntary organizations (PVOs) also receive U.S. support.

Additionally, the United States indirectly supports water and sanitation activities through contributions to multilateral organizations--the International Bank for Reconstruction and Development (World Bank), the United Nations Development Program, the United Nations Children's Fund, and the regional development banks. The World Bank is the largest financial participant in these types of activities in developing countries. Assistance, however, is mainly for large urban systems.

An AID analysis of water supply and sanitation activities[2] attributes a recent decline in direct U.S. support to the

[2]Community Water Supply in Developing Countries: Lessons from Experience, U.S. Agency for International Development, Program Evaluation Report No. 7, September 1982.

--decrease in Health, Population and Nutrition (Development Assistance) funds as a portion of the overall AID program;

--high per capita cost (depending on specific circumstances) of providing water compared to other alternatives available for averting deaths among infants and children; and

--decrease of the direct-hire technical expertise available within the Agency.

In attempting to overcome the decline of technical expertise, AID centrally funds a $12.5 million Water and Sanitation for Health (WASH) Project which provides outside consultants. Since the project was initiated in 1980, a broad range of services has been made available to AID missions, regional bureaus, and central offices; international organizations, public and private agencies of host governments; PVOs and other U.S. agencies. Between August 1980 and September 1982, the WASH Project responded to almost 130 formal requests for assistance, and numerous less formal tasks for about 47 of over 60 AID missions or offices.

OBJECTIVES, SCOPE, AND METHODOLOGY

This report concerns U.S. participation with developing countries in providing adequate supplies of safe water and proper sanitation to rural areas. Our primary objective was to assess how effectively U.S. financial assistance is being used to meet these basic human needs. This included an examination of the extent total project resources actually reach target populations. Another objective was to examine how well projects are being designed and implemented to overcome the traditional and well-known technical and administrative constraints to the continued delivery of water and sanitation services. We also examined the extent improvements in the quality and quantity of water are being measured.

At the beginning of this review, we examined AID's overall involvement in potable water supply and sanitation activities. This includes the rehabilitation and construction of large urban water and sewage systems financed from the Economic Support Fund; as well as relatively small rural systems, technical assistance and research financed through Development Assistance. We narrowed the scope of our review to development assistance-type projects mainly in rural areas because of the (1) world-wide area in which this type of project is being implemented, (2) vast majority of rural people who need water and sanitation services, (3) humanitarian nature of this type of assistance, and (4) relationship between water and sanitation, and the perceived linkage to economic and social progress--including the potential for improved health.

We reviewed information at AID headquarters and discussed the status of recently completed and ongoing projects with officials of the Agency's central and regional bureaus. The projects varied in the method and stage of implementation, purpose, objective and AID involvement. To obtain a broad perspective, and illustrate a variety of these considerations, we selected projects in Africa, Asia and Latin America for our evaluation.

In Africa, we reviewed an ongoing AID grant project for a village self-help effort which is part of one country's national water supply program. In another African country, we evaluated the water supply component of an integrated regional planning and village development project financed partly with an AID grant and implemented by a private contractor. At the time we visited the project, water supply activities were being terminated. We also observed two other water supply projects in this country being financed with AID disaster assistance grants. These two projects basically involved the procurement of commodities. The projects were in the early stages of implementation at the time of our visits. We also spoke with regional AID officials in East and West Africa to obtain a perspective of the water and sanitation issues peculiar to the area.

In Asia, we reviewed a project financed, in part, by both an AID grant and loan. The purpose of the assistance was to (1) extend a potable water transmission line, and (2) expand service to a large number of poor people. The project was implemented by the host government and a private contractor, with AID oversight.

In one of the two countries we visited in Latin America, we examined an AID-assisted project designed to provide low-cost water and sanitation facilities for small rural communities. Although in the early stage of implementation, the project is intended to build on the experiences of a completed project financed by AID and implemented by a PVO, which we also visited. In the second country, we reviewed two additional projects. The first, assisted by an AID grant and loan, is attempting to employ low-cost, water-supply technology with other health and nutrition interventions. The other is an ongoing project being implemented by a PVO.

We did fieldwork in Ecuador, Indonesia, Malawi, Peru, and Tanzania between October 1982 and March 1983. In addition to reviewing relevant documents, including previous AID evaluations and audit reports, and visiting project sites, we held extensive discussions with many AID and host government representatives. We also spoke with community leaders, PVO officials, contractor personnel and others involved in water supply and sanitation efforts.

We believe the issues which we identified in the projects reviewed represent some of the successes and problems AID is

experiencing in helping to provide safe, adequate water and proper sanitation in developing countries. Although the problems cannot be portrayed in a statistical sense, they do illustrate the typical impediments to delivering this type of assistance. Our recently completed review of U.S.-supported irrigation projects also reflects many of the management problems we observed in our review of potable water supply and sanitation activities.

This review was conducted in accordance with generally accepted government auditing standards.

CHAPTER 2

IMPEDIMENTS TO DELIVERING WATER AND SANITATION FACILITIES

According to the World Bank, many factors inhibit the installation and continued operation of basic water supply and sanitation facilities in developing countries. These constraints include the

--low priority reflected in the absence of policies, institutions and trained personnel to facilitate the delivery of the services and community participation to foster installation of the facilities;

--inadequate financial support and cumbersome logistics associated with providing such services to dispersed populations having limited resources; and

--technological problems combined with the lack of long-term financial support impeding the continued delivery of the intended level of service.

Impediments involving priorities, the marshaling of resources, and poor logistics hamper AID-assisted projects from fully achieving the immediate purpose--the timely delivery of water and sanitation services.

We found that, generally, AID is successful in improving access to basic water and sanitation services. However, projects in three of five countries we reviewed are not yet delivering the planned level of resources or reaching the intended number of beneficiaries. In the same three countries we found that the project designs often do not adequately allow for common implementation problems and delays. As a result, we believe, planning documents are overly optimistic in what can reasonably be provided a target population during a specified period.

OVERVIEW OF OUR OBSERVATIONS

The table below and the following discussion relate our observations concerning the project implementation process, and the delivery of water and sanitation services to the intended beneficiaries.

OVERVIEW OF IMPEDIMENTS TO TIMELY IMPLEMENTATION AND DELIVERY OF SERVICES

	Lack of government priority	Procurement problems	Inadequate project management, oversight or accounting	Lack of qualified personnel	Lack of financial support	Lack of community support/ participation
MALAWI						
--Self-Help Rural Water Supply Project (612-0207)						
ECUADOR						
--Integrated Rural Health Delivery System Project (518-0015)						
--Rural Water Systems (OPG) Project (518-0020)						
INDONESIA						
--Surakarta Potable Water Project (497-0262)		X				
PERU						
--Rural Water Systems and Environmental Sanitation Project (527-0221)	X	X	X	X	X	
TANZANIA						
--Arusha Planning and Village Development Project (621-0143)	X		X	X	X	X
--Mbugwe Division Water Supply (621-0167) and	X	X		X		
--Masai District Village Water and Transport Development Project (621-0170)	X			X		

WATER AND SANITATION AS A PRIORITY

The International Drinking Water Supply and Sanitation Decade places responsibility for establishing priorities and determining the emphasis to be placed on delivering these services with the developing countries. Considering the vast array of development needs facing many countries, not all can provide the financial, institutional, and personnel resources necessary to achieve the goal of providing safe drinking water and adequate sanitation to all people by 1990. Individual commitment and the priority attached to providing water and sanitation services are important elements of successful AID-assisted projects.

Malawi--building on a tradition of priority and self-help

Malawi's rural water supply activities have been widely cited as an example of what can be accomplished with government commitment and community involvement. This combination has attracted a wide-range of external donors.

In 1968, the country began developing, with AID assistance, gravity-fed water supply systems with public taps. The goal is to provide piped water within a quarter of a mile of all users. The government furnishes the material, and the villagers install the system on a self-help basis--digging trenches, transporting supplies, laying pipe, backfilling and building drainage aprons--at no cost to the project. Between 1968 and 1980, about 1,800 miles of pipe, and almost 2,800 public taps were installed.

In 1980, AID approved a $6 million grant to be expended over 5 years for the Self-Help Rural Water Supply Project to assist Malawi to further meet the need for piped water and coordinate public health activities. The country had already established a priority for rural water supply systems, and demonstrated an ability to complete similar projects. The organizational structure was also in place, including professional and skilled staff. The AID-assisted project intends to

--support the design and installation of up to 23 rural water systems;

--establish a research component to examine the technical, economic, health and social dimensions of the program; and

--provide a public health coordinator to achieve maximum health-related benefits.

Over 75 percent of the AID funds are intended for direct assistance--commodities, vehicles, equipment, fuel, and tools. The remainder supports the field staff, maintenance program, monitoring, evaluation, and contingencies. Based on our analysis,

funds are being committed and expended basically in accordance with the financial plan.

At the time of our field work, most of the systems receiving AID support were under construction. We observed villagers moving obstacles, digging trenches, and laying pipe. Also, in line with a local practice, water was being provided to some project sites as a demonstration that the systems can work and motivate the local inhabitants to complete the distribution network.

In 1981, WASH used Malawi as the backdrop to develop methods for the evaluation of community water supply and sanitation projects. The report[1] cites the following reasons for success:

--"The system has evolved . . . as a response to a real need.

--The community has been involved in the project at all levels and through the whole cycle of planning, implementation, and maintenance.

--Rural communities have always been . . . cautious of innovations until they have been tried and shown to be appropriate to the conditions in which they live. It has been possible to gain the confidence of the Rural Committees, through successful demonstration, and to involve them in a technical program of development, which then generates confidence for future projects."

The report also notes that "This did not, of course, happen over night."

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[1] Evaluation Methods for Community Rural Water Supply and Sanitation Projects in Developing Countries: A Synthesis of Available Information (WASH, Technical Report No. 4, March 31, 1981).

A community inaugurates a new public water supply in Malawi.

Ecuador--building on a commitment to rural development

Ecuador has established a national council to plan and coordinate development programs and has approved a plan to meet the basic needs of the country's poor majority. This country specifically requested AID to direct a major portion of its resources to this effort. AID and the host country agreed that the assistance would (1) focus on institution building, (2) be limited to specific regions, and (3) be phased in over several years to facilitate planning and implementation.

In June 1981, AID authorized a $6 million loan and a $1 million grant to be expended over 5 years for the Integrated Rural Health Development Services Project as part of the program. A major aim is to create an institutional capacity which will enable the government to replicate the project on a national scale. There is also a $2.5 million water and sanitation component intended to serve at least 50 percent of the population in three project areas. In January 1982, a separate entity within the host country implementing agency was organized to coordinate this part of the project. By May 1982, paraprofessionals were being placed in the regions, and implementation was being delegated to the local level. By the following August, six water systems were under construction in two areas, and hand pumps and latrines were being installed in the other area. Based on this initial progress, AID authorized another $1.2 million loan and a $130,000 grant in September 1982 to expand project activities.

By February 1983, initial activities had begun in three more regions. Also, an operating plan was adopted to implement several studies, seminars and procurement activities; and management training was completed. Additional procurement authority was delegated to the local level--a significant step toward decentralization and a requisite for effective implementation.

Our fieldwork confirmed that the project is progressing well--conditions precedent to disbursement of funds were met in a timely manner, operating plans were developed and being implemented, inter-agency relationships were established, and the project was being adequately monitored. The project has had the benefit of a full-time AID engineer since its inception. Regional offices we visited were staffed with supervisory engineers, environmental sanitation personnel, paraprofessionals, health promoters and other support staff. We also noted that U.S. technical assistance was heavily involved in the project. According to AID officials, the water and sanitation component is ahead of schedule.

As in Malawi, the villagers provided labor at no cost to the project. This type of community involvement demonstrates a commitment to the project, and a desire for the improved facilities. We also noted that construction in one village was stopped when the inhabitants declined to pay for the service. This demonstrates the host country's commitment to targeting the project only to communities which are willing to support improved water and sanitation services.

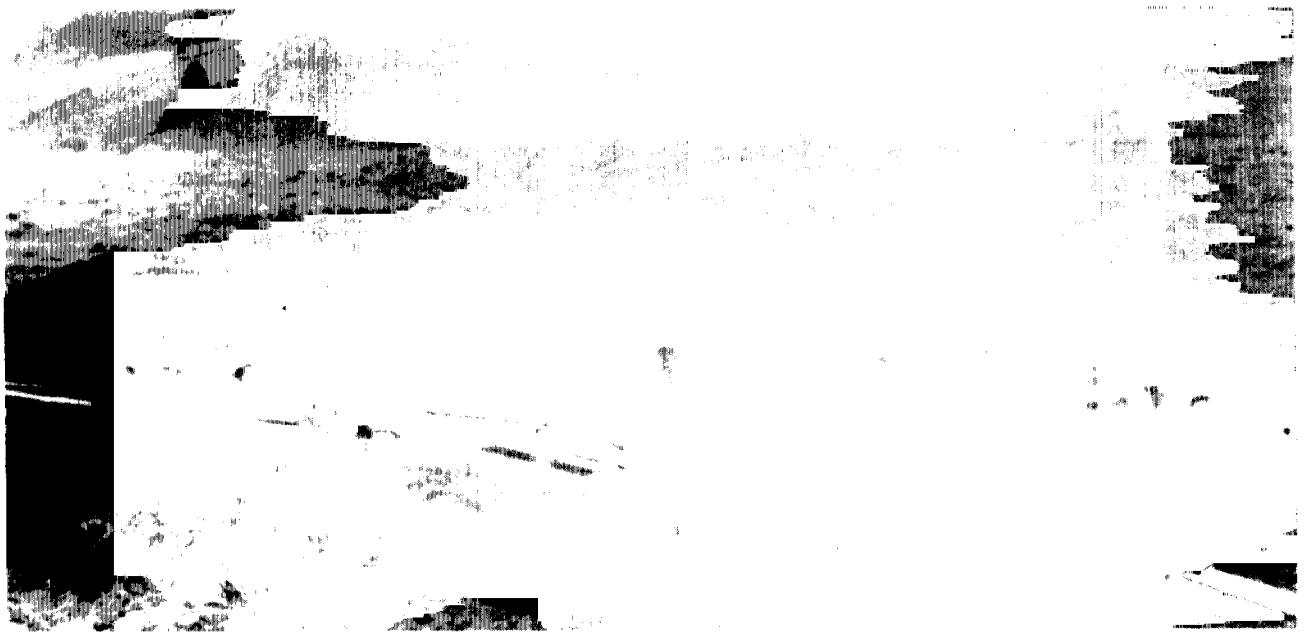
In September 1980, AID authorized a $181,000 Operational Program Grant (OPG) to a PVO to implement the Rural Water Supply Project in Ecuador over a 1-1/2 year period. Originally, the purpose was to install or improve water supply and sanitation facilities for about 3,000 people and complement other ongoing donor-supported health-care activities.

Initially, delays in signing agreements, organizational changes, and border disputes hindered progress. Later, faulty system designs, particularly for the principal community, also delayed full implementation. The early constraints were overcome, and an AID engineer resolved the design problems.

Despite the delays, the project will probably reach more beneficiaries than envisioned in the project plan. The principal system alone will serve nearly 3,000 people. Two other systems will serve another 1,000 people. By late 1982, the design for another system was complete, and plans for two more systems were also underway. The devaluation of the host country's currency allowed for the extended scope of activity.

This project illustrates what can be accomplished through community participation. Before the design problems surfaced, the largest community was dropped from the project because it

could not provide the necessary counterpart funds. The community took the initiative, successfully petitioned the provincial council, and obtained the necessary financial support. The council also planned to purchase special equipment to speed the installation of the main distribution line through rough terrain. Thus, local support, along with AID financial and technical assistance, can overcome serious implementation problems and deliver essential services to rural populations.



Community members participate in laying water supply distribution pipe in Ecuador (above) and Malawi (below).

Source: AID

IMPEDIMENTS TO DELIVERY OF PROJECT RESOURCES

Malawi and Ecuador have successfully implemented projects to meet the basic human needs of rural populations and established the institutional framework for implementing these types of development programs. Other projects we evaluated were implemented in a less favorable environment, and resources were not being delivered as envisioned in the plans. The following examples further illustrate the relationship between the priority a host country assigns to providing basic water and sanitation services, and the extent AID assistance is reaching the intended beneficiaries.

Indonesia--providing services to the poorest people

In many parts of the developing world, increasing populations have placed additional burdens on existing water supplies. Such is the case in Indonesia, where the government requested AID assistance to expand an existing water distribution system, increasing the supply of water, and upgrading sanitation facilities for lower income and poor and destitute people in and around a large community. In 1977, AID responded with a $6.8 million loan for the Surakarta Potable Water Project. Originally the project was to terminate during January 1982. However, it was extended 1 year. The funds were for off-shore procurement of pipe, accessory equipment, and technical assistance. Indonesian contractors installed the system using labor provided by the government.

At the time of approval, only about 10 percent of the people in the project area received water from the existing system. The rest used shallow wells, which are often contaminated, and a nearby river.

The major purpose of the project was to expand the water distribution system to reach about 35 percent of the population by

--constructing a new transmission main,

--rehabilitating existing distribution lines, and

--expanding the distribution system.

Low income families were to be served by 13,000 new yard hydrants in the most densely populated areas. The very poor were to be served by 200 new public taps, 10 new bath houses with space for health-care activities, and upgraded latrines. To ensure that the benefits reached those most in need, the local water authority adopted a policy of restricting additional commercial connections and service to households in the more affluent areas until the project reached the high-priority target groups.

The project has some notable accomplishments. AID officials told us that the transmission and distribution systems are delivering the planned quantity of water. Procurement savings and additional water from project wells allowed the distribution network to be expanded from 10 to 15 districts and eventually could reach about 50 percent of the people in the area.

Not all of the resources, however, were delivered according to the project plan. For example, only about 2,500 of the 13,000 planned yard hydrants, and about 130 of the 200 planned public taps were installed by the end of the project. In response to a draft summary of our analysis of the project, the mission stated that the material for the installation of the hydrants and public taps which were funded by the project have been received by project authorities. Delays in signing up customers and financial arrangements which needed to be concluded before installing the hydrants were impeding progress. According to the Mission Director, AID is pursuing the resolution of these matters, although direct involvement in the project has been terminated.

Peru--lack of priority hinders timely implementation

In rural areas of Peru, about 98 percent of the households have no connections to functioning potable water systems and no sanitation facilities. The government and external donors are attempting to provide these services to communities of 500 to 2,000 inhabitants. Since smaller communities are not targeted by those programs, AID approved the Rural Water Systems and Environmental Sanitation Project to meet their needs. The goal is to improve the health and well-being of the rural poor by providing potable water, sanitation facilities, and health education.

Another aim is to strengthen the staff of regional health offices by promoting the creation of permanent environmental health teams. In addition to the water supply, latrine, and health education elements, the design includes community participation, training, technical assistance, and special studies. The intention is to integrate these services with other AID-assisted primary health-care activities.

This 5-year project, originally authorized in September 1980, was intended to reach 420 small communities in six health regions. The scope was limited to a maximum of six regions, recognizing the funding limitations and the strengths and weaknesses of the administrative infrastructure. A $5 million loan and a $0.5 million grant were provided to Peru for this purpose. In August 1982, an amendment was approved to extend the scope by 240 additional water systems in four more health regions. An additional $5 million loan and $0.5 million grant were authorized to support the expanded activities. A total of

$11 million is now available to install 660 water systems in 10 health regions. The completion date was extended to September 1987. Initially, delays centered on the slow development of implementation and operational plans for the first year. There was an 8-month delay in meeting the conditions precedent to disbursement of the loan because of reorganizations within the host government and the lack of technical assistance. Also, there was a need for extensive field visits.

At the time we visited Peru, the project was in the third year, and still not being implemented in a timely manner. Major problems which were then affecting progress were:

--Slow design and installation of the water supply systems, because of the lack of qualified personnel and adequate commodities. The personnel problems centered around the relatively low salaries Peru was providing the system designers. Procurement was hampered by a limited capability within the AID mission to prepare the necessary documentation. Only 30 of the 100 systems planned for that period were installed or under construction.

--Lack of special studies intended to guide project activities.

--Ineffective integration with the primary health-care projects.

The water supply and sanitation project also provided for long-term grant funded technical assistance to focus on (1) ensuring the adequacy of the initial planning process, (2) assisting with estimating and ordering material, (3) developing a supervisory system, and (4) improving the administrative mechanisms. This assistance was considered especially important during the first year, given the decentralized nature of implementation, and the problems which could result from the regionalization of project activities. At the time of our review, none of the technical assistance envisioned in the plan had been provided to the project. Peru and AID could not agree on the cost, type, or source of the assistance. If the assistance had been provided, many of the problems may have been avoided.

The disbursement of funds reflects the slow progress. As of January 1983, when over 25 percent of the revised implementation period for the water supply and sanitation project had elapsed, only about 3 percent of the $10 million loan and 4 percent of the $1 million grant had been disbursed. The primary health-care projects were experiencing similar delays. The first was approved in September 1979. As of June 1983, when this project was 75 percent through implementation, only about 24 percent of the $5.8 million loan and 13.5 percent of the $1.4 million grant had been disbursed. The second was approved

in June 1981. Also as of January 1983, when this project was 25 percent through the planned period of implementation, none of the $4 million loan and only 2.7 percent of the $6.8 million grant were disbursed.

We have issued a separate report on the Rural Water Systems and Environmental Sanitation Project.[2] We concluded, in part, that the (1) project is still in an early stage of implementation--2-1/2 years after being authorized, (2) scope of activities is too ambitious--considering the present technical and administrative capacity of the implementing agency, and (3) additional funds were committed without fully considering the problems causing slow progress. In our view, regionalization is not a priority of the host country and is impeding the delivery of water and sanitation services to the small rural communities. In response to our draft report, the AID mission restated their belief that Peru was committed to the project objectives, and informed us of several steps taken since our visit to redirect activities.

Tanzania--implementation in a cross-current

Tanzania has endorsed the goal of safe water for all people by 1991, however, it is unlikely this objective will be realized. During recent years, the financial resources allocated to the water sector have actually declined, both in real terms and as a percent of the national budget. Also, 90 percent of the cost to develop rural water supplies is financed by the donor community. We believe this reflects the low priority Tanzania gives this type of development activity.

AID's overall development strategy in Tanzania has been to assist in the development of the country's economic infrastructure, particularly in support of the agriculture sector. The AID-assisted Arusha Planning and Village Development Project was part of that strategy. Started in August 1978, this $14.5 million AID grant project intended to

--strengthen the planning, implementation, and evaluation capabilities of the region;

--improve agriculture production;

--identify and promote other economic development; and

--improve the social and economic infrastructure.

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[2] A Troubled Project--Rural Water Systems and Environmental Sanitation in Peru (GAO/ID-83-42, June 2, 1983).

A $3 million water development component was included in the design of the project. The purpose was to

--develop wells with hand pumps and water catchments;

--provide technical assistance to support the regional organization responsible for water development;

--support three water development crews to carry out construction; and

--procure transportation and spare parts.

Only 24 villages benefited from the project. In terms of facilities, the project only installed 33 of 139 planned shallow wells, and 2 of 14 planned boreholes. None of 11 planned water catchments were provided. Only one of the three construction crews was formed--partially explaining why the planned number of facilities were not installed.

A primary reason for the shortfall in the installation of the water supply facilities was a decision by the AID contractor and local officials to disburse only about $1.2 million of the $3 million planned for this component of the project. Of the remainder, about $1.2 million was reallocated for road construction--a locally determined priority. This reallocation, which exceeded the authorized 15 percent shift of funds between components, was done without AID approval, because of inadequate accounting and oversight of the disbursements. Water supply activities were abruptly stopped upon realizing that all of the available funds had been disbursed.

This project also lacked an important element we observed in the relatively successful projects in Malawi and Ecuador--community participation and support. Volunteer labor to construct the systems was unreliable. The lack of enthusiasm was cited by a project official as a reason only 6 of 14 high-priority communities were reached by the project.

We reviewed two other water supply projects in Tanzania funded through a provision for disaster relief to drought-stricken African nations contained in the Foreign Assistance Act of 1961, as amended. Although authorization for this section of the Act was repealed in 1978, funds remained available until expended. Given the source of the assistance, we examined the

Mbugwe Division Water Supply Project and the Masai District's Village Water and Transportation Development Project to determine if the relief was reaching the intended beneficiaries in a timely manner. The villages are in a drought-prone area. During periods when surface water is available, there are serious health hazards caused by contamination.

The projects were authorized in August 1981, and were originally to be completed in 1 year. The Mbugwe project provided a $150,000 grant to finance the cost of pipe and fittings for the extension of a gravity-fed water supply system to three villages in the most drought prone area of the region. The pipe had not been ordered 9 months after the project was authorized. At the time of our review in December 1982--almost 18 months after authorization and nearly 6 months after the project was to be completed--construction had not started, although the commodities had been delivered.

The Masai project provided a $590,000 grant for vehicles, windmills and steel tanks to pump and store water. The windmills were to replace diesel pumps, thus ensuring a more reliable source of water. The use of the steel tanks was to avoid the delay in installing concrete structures. At the time we reviewed the project--6 months after the original completion date--most of the commodities had been delivered after some delay. The windmills, however, were still in storage because Tanzania had not provided the trained personnel and equipment to proceed with construction. The use of windmills was originally proposed because they proved effective in comparable situations in the country. Government officials told us, however, that another donor discontinued using this type of equipment because of insufficient wind and maintenance problems.

CONCLUSIONS

AID supports a diversity of approaches to providing water and sanitation services in developing countries. Project designs range from providing financial support for the procurement of commodities for ongoing national programs, to other projects addressing a wider range of needs. The latter types of projects include components for institutional development, training, technical assistance, education, primary health-care, and other activities.

Based on our evaluation of projects included in the scope of this review, AID is most successful in meeting water and sanitation needs where the desire for such services is a priority of both the host country and the target communities. We believe this priority is reflected, in part (1) by a willingness of a host country to support an institutional framework to foster the delivery of the services, and (2) where target populations are willing to participate in the implementation activities.

In Malawi, the administrative framework, policies and objectives were already established at the onset of the AID-assisted project. The host country had identified a workable technology, mobilized community support, and gained a wide reputation as a model of a successful water supply program. AID is building on this success by providing the resources to expand construction to areas still needing access to adequate supplies of water, and adding a public health dimension to the nationwide program.

In another example, Ecuador made a formal commitment to bring the rural poor into the mainstream of social and economic development by providing community based services. The country formulated an overall plan, established an institutional framework to implement and coordinate the program, and specifically requested AID assistance to carry the program forward. The host country carried through with this commitment--providing technical and administrative personnel, and delegating authority to the local level.

In contrast, the declining national budget for water and sanitation in Tanzania, and the heavy reliance on the donor community may reflect a lower priority given this sector of development.

Community involvement also fosters project implementation. It reduces the overall cost of the facilities, instills a sense of ownership, and, in Malawi, attracts other donors to this type of development. Community participation combined with proper management and oversight can also bring about progress in spite of institutional weaknesses as demonstrated by the Rural Water Systems (OPG) Project in Ecuador.

The projects in Indonesia, Peru and Tanzania did not install the intended number of facilities and were not implemented according to the plans. In Indonesia, the slow delivery of material and administrative delays hampered the Surakarta Potable Water Project from reaching the intended number of beneficiaries. In Peru, problems meeting the conditions precedent to disbursement and developing the operational plans in a timely manner, the lack of qualified staff and technical assistance, and the slow procurement of commodities were impeding the implementation of the Rural Water Systems and Environmental Sanitation Project. In Tanzania, the lack of a full complement of construction crews partially explained the shortfall in the number of facilities installed by the Arusha Planning and Village Development Project. In the same country, the slow procurement of commodities and the lack of qualified personnel caused delays in implementing the "drought-relief" projects and providing needed supplies of water. We believe these examples illustrate common implementation problems. We also believe these impediments should be anticipated in the implementation schedules. These schedules should reflect what realistically can be

accomplished during the relatively short period of AID involvement--originally between 1 and 5 years for the projects we reviewed. Based on the problems and delays we observed in Indonesia, Peru and Tanzania, we further believe that project designs are sometimes overly optimistic in what they intend to accomplish during the implementation period. We agree with the WASH observation that the project in Malawi did not happen "over night." We believe it is an important lesson for this type of program and should be reflected in project designs.

We recognize that project proposals and designs cannot fully anticipate all of the problems and constraints which affect the timely delivery of water and sanitation services to the intended beneficiaries. We also believe, however, that the project review and approval process requires a reasonable basis on which to judge the relative merits of competing demands and the prospects for success. This is especially important where the vast need for safe water and adequate sanitation greatly exceeds AID's resources.

RECOMMENDATIONS

We, therefore, recommend that the Administrator, AID, direct that:

--Project proposals objectively assess the resolve and capacity of the (1) host country to implement and manage the projects, and (2) communities to participate in installation activities.

--Implementation schedules objectively anticipate the common impediments to the timely installation of the facilities, and the range of activities and services which can be accomplished and delivered during the life of the project.

AGENCY COMMENTS AND OUR EVALUATION

AID agreed with our recommendations concerning the need for an objective assessment of the willingness of countries and the target communities to participate in installation activities, and reasonable implementation schedules. They stated that many of the problems we observed are common to other types of development activities.

The Agency commented on our assessment of individual projects. A subsequent AID evaluation of the Self-Help Rural Water Supply Project in Malawi confirmed our analysis. The Agency also provided additional cost data and updated health education activities since our visit. AID intends to use the Integrated Rural Health Delivery System Project in Ecuador as a model for other projects in the region.

AID stated that the implementation problems we noted in the Surakarta Potable Water Project in Indonesia reflect inadequate host country institutional support. As a result, projects in Sri Lanka and Thailand are emphasizing host country support.

In their comments, AID provided a September 1983 update of the Rural Water Systems and Environmental Sanitation Project in Peru, stressing the assignment of a full-time engineer and increased decentralization. However, we note the continuing slow pace of construction and disbursement of funds. At the time of the update, only 31 of 660 planned systems were installed or under construction (1 more than when we visited the project in January and February 1983). Also, only $625 thousand (6 percent) of the $10 million loan and $87.2 thousand (9 percent) of the $1 million grant have been disbursed--3 years after the project was authorized.

CHAPTER 3

ADEQUATE UPKEEP IS AN ESSENTIAL AND DIFFICULT ACTIVITY

Proper operation and maintenance is essential to the long-term success of water and sanitation projects--assuring continued delivery of service and protection of the investment in the facilities. According to WHO and the World Bank, developing this capability has proven difficult and many donor financed systems throughout rural areas of the developing world are inoperable. Operation and maintenance problems, however, are not unique to donor assisted projects. Even more locally financed systems are not operating properly because of inadequate upkeep.

Our evaluation of operation and maintenance focused on elements which AID recognizes as important components of an effective program. These include

--financial support to cover recurring costs,

--personnel to perform needed repairs, and

--user health education to foster interest and promote upkeep of the facilities.

Implicit in this analysis is the institutional support needed to implement these activities. We found that lack of attention to these issues raises doubts about the ability of projects in Indonesia, Peru, and Tanzania to continue to provide benefits to the target populations in the years ahead. Our discussion of projects in Ecuador and Malawi illustrate how these impediments can be overcome. The following table and discussion relate our observations.

OVERVIEW OF PROBLEMS HAMPERING
LONG-TERM OPERATION AND MAINTENANCE

	User fees	Other subsidies [a]	Operation and maintenance personnel	User education	Institutional support [b]
MALAWI					
--Self-Help Rural Water Supply Project (621-0207)	(c)	X			
ECUADOR					
--Integrated Rural Health Delivery Systems Project (518-0015)					
--Rural Water Systems (OPG) Project (518-0020)					
INDONESIA					
--Surakarta Potable Water Project (497-0262)	X		X	X	
PERU					
--Rural Water Systems and Environmental Sanitation Project (527-0221)	X		X	X	X
--Rural Water/Health Services Project (OPG) (527-0177)			X	X	X
TANZANIA					
--Arusha Planning and Village Development Project (621-0143)	(c)	X	X		X

[a]Includes support from local or national governments.
[b]As indicated by host country policies and procedures to provide financial support, trained personnel, and user health education.
[c]User fees not used as a financial mechanism.

INADEQUATE FINANCIAL SUPPORT FOR RECURRING COSTS

An effective operation and maintenance program requires regular financial support, either through direct payments from the users, or the government. According to AID, the preferred arrangement is where the community members support the cost of upkeep through the payment of user fees. This is not, however, an acceptable approach in all regions of the world. Where local customs and traditions do not foster this method, governments must provide the necessary financial resources.

We found that ensuring continued financial support is difficult. The collection of user fees has met with limited success and in general, host government support has not been adequate. Financial support was a problem in four of the five countries we reviewed.

In Indonesia, the Surakarta Potable Water Project relies on user fees to finance the upkeep of the system. There is no government support for upkeep. At the time of our review, however, broken water meters, inaccurate meter readings, and

unauthorized connections were hampering attempts to collect all fees. A shortfall in the planned number of hydrants was also preventing the enterprise from earning additional revenues from an expanded service base.

In Peru, the Rural Water Systems and Environmental Sanitation Project also relies on user fees. Although in an early stage of implementation at the time of our review, fees were not being collected--including advance fees which were intended to demonstrate the communities' commitment to the project. An Inter-American Development Bank (IDB) official in Peru told us that inadequate fees are also hampering the maintenance of about half of the 700 systems installed with assistance from that organization.

In Tanzania, government support for operation and maintenance has been a long-term and wide-spread problem. User fees are not a traditional source of revenue. The government is responsible for upkeep of the systems. However, a host country official told us that the budget for such activities has decreased by more than 50 percent since 1980. As a result, older systems are failing faster than new construction and the population being served has actually declined.

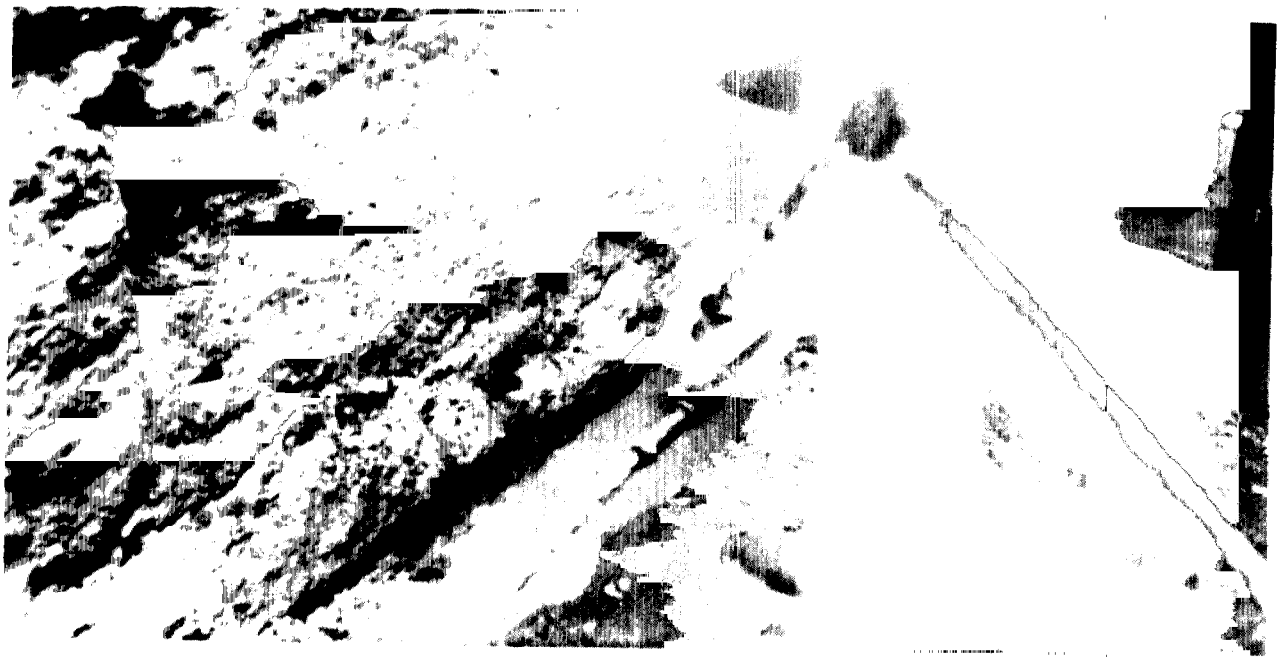
Providing for long-term support

User fees can provide an adequate source of revenue. Host governments can also plan for long-term support. The priority placed on the need for proper operation and maintenance is an important element of success.

In Ecuador, operation and maintenance is a community responsibility. A project official told us that all the systems have adequate revenues provided by user fees. A 1978 study by the Pan American Health Organization and the World Bank found that user fees are a tradition in rural areas of the country, and many systems accumulate a surplus.

In Malawi, the government assumes responsibility for the upkeep of rural water systems. The country has begun to stockpile material in anticipation of future maintenance needs.

Malfunctioning public tap (above) and broken household connection (below) in AID-assisted projects in Peru.



LACK OF PERSONNEL TO PERFORM REPAIRS

The installation of facilities does not complete the process of providing water and sanitation services. In rural areas personnel at the community level are particularly important for operating the system, completing routine repairs, and ensuring a reliable level of service.

In Indonesia, the Surakarta water system incurs serious losses of up to 65 percent of available water. AID sought to solve this problem by augmenting the personnel resources of the enterprise. Supervisors were trained in leak detection and proper operation and maintenance procedures. At the time of our review, repairs were lagging behind construction because sufficient personnel were not being provided by the water authority to complete the work.

In Peru, the Rural Water Systems and Environmental Sanitation Project intends to remedy a wide-spread maintenance problem by training personnel at the national, regional and community levels. The lack of technical assistance was precluding the implementation of the planned training program at the time of our review, almost 3 years after the project was approved. Informal instructions, however, are being provided to community members by the construction crews. According to a host country project official, a formal training program would provide long-term benefits to the project. A 1981 AID evaluation of the OPG project also noted the lack of information and training for the villagers in the operation and maintenance of the completed systems.

In Tanzania, villagers are expected to perform minor repairs. Larger problems are to be referred to district and regional maintenance personnel. The project did train villagers to maintain the facilities, and provided tools for this purpose. The maintenance problems we observed--broken taps, missing parts and equipment, and uncontrolled flows of water--point to the lack of local initiative and periodic inspections by supervisory personnel which, in turn, points to a breakdown of the supporting institutional network. The AID contractor told us, in summary, that the communities must be involved in project planning and construction if they are expected to carry out the endless task of maintenance.

Community participation and institutional support are important elements of successful maintenance programs. Ecuador and Malawi are using this combination to foster the upkeep of their rural water systems.

In Ecuador, operation and maintenance are community responsibilities. The AID-assisted projects are building on this concept of local responsibility. All of the systems we visited had

trained operators. "Promoters" live in the villages and provide on-the-job training during construction which is reinforced with additional training by regional officials. Training is conducted in tandem with construction.

In Malawi, there is a cadre of personnel skilled in minor repairs, since construction is a self-help activity. Volunteers are also trained to repair the distribution lines, equipment, and areas surrounding the public taps. Our review of maintenance records from one area shows that nearly all of the systems are in good working order which, we believe, attests to an effective maintenance program.

INEFFECTIVE HEALTH EDUCATION HAMPERS PROPER MAINTENANCE

Health education indirectly contributes to the proper operation and maintenance of water supply and sanitation facilities. By informing the users of the health benefits of improved water and sanitation, the beneficiaries are more likely to support and participate in the upkeep of the systems.

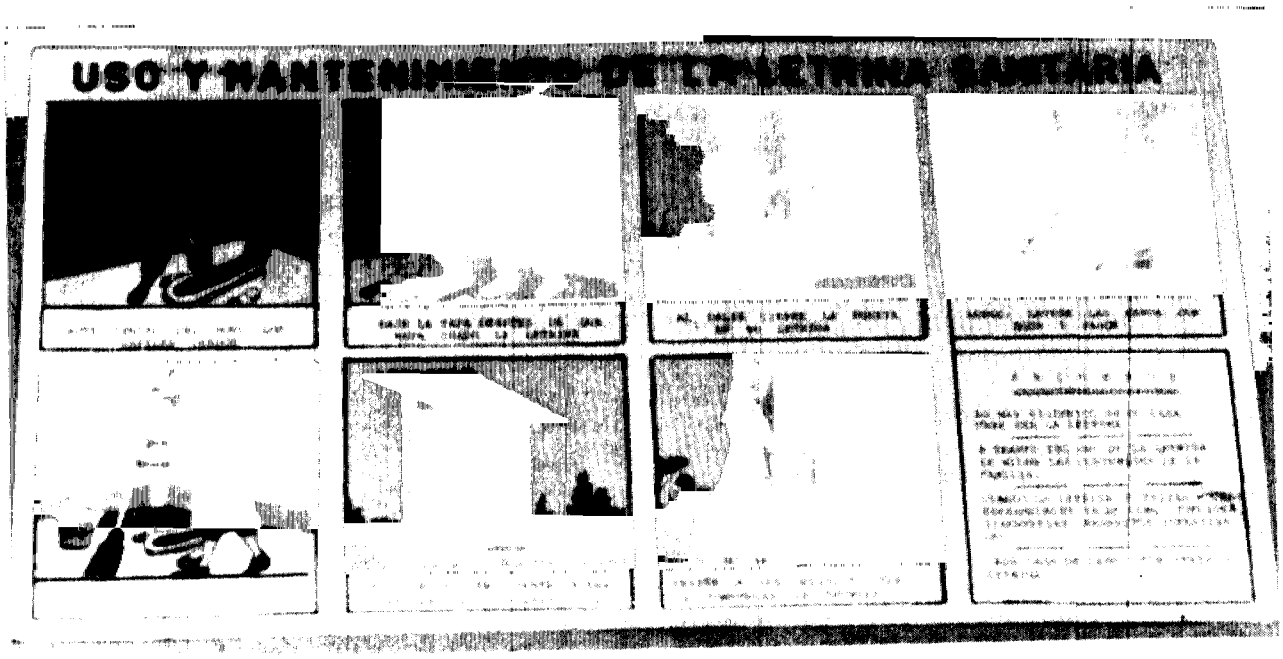
In Indonesia, the design of the Surakarta Potable Water Project included an education component, because an earlier survey noted that the inhabitants lacked an understanding of the relationship between water, sanitation and better health. At the time of our review there was no effective health education program. Latrines and bathhouses were in disrepair, and the project officer reported that this was a threat to a major component of the program. In response to our preliminary summary of facts, the Mission Director informed us that the condition of the latrines and bathhouses had improved. No mention was made, however, of the start of a formal education program as envisioned in the project design.

In Peru, the health education component was not an active part of the Rural Water Systems and Environmental Sanitation Project. AID and Peru could not agree on the technical assistance for this purpose. Also, special studies intended to guide these efforts had not been undertaken at the time of our review. Other AID assisted primary health-care projects were also intended to foster health education. However, these were also experiencing serious implementation problems which were precluding integration of these programs. An AID evaluation of the OPG project noted that the health education and vaccination campaigns met serious implementation problems. The report attributed the difficulties to bureaucratic problems involving inter-agency discord. The vaccination campaign was dropped and the health education component was modified. Instead of bimonthly visits to all villages, only three visits were made to 13 of 80 villages. According to an IDB official, the lack of health education contributes to long-term operational problems.

In Tanzania, the project did not have a health-education component. The water-supply component was part of a larger rural development effort.

In Ecuador, we found that health education is an integral part of the AID-assisted projects. The village-based "promoters" foster this as well as other project activities discussed earlier. The host country is now considering other alternatives to this approach as project activities expand and place additional burdens on the present staff.

In Malawi, the Self-Help Water Supply Project recognized the lack of a nation-wide health education program. The project supports the activities of a health coordinator. At the time of our review, this individual had only recently become actively involved in the project. However, an action plan had been developed, and contacts were being established with project officials and villagers to discuss health-related matters.



Health education material showing proper use and maintenance of sanitation facilities.

OUR REVIEW OF IRRIGATION SYSTEMS REFLECTS THAT PROPER UPKEEP IS A SERIOUS PROBLEM

We recently reported on the results of a separate but related review of the operation and maintenance of U.S.-supported irrigation systems in Indonesia, Sir Lanka and Thailand.[1] The purpose was to determine how AID can (1) improve operation and maintenance practices, and extend the economic life of the irrigation systems, and (2) design projects which adequately emphasize operation and maintenance requirements. The evaluation shows that many of the problems we observed concerning the proper upkeep of potable water supply and sanitation facilities also hamper the operation and maintenance of irrigation systems. As a result of our evaluation of the irrigation systems, we found, in part, that:

--Donors did not give sufficient attention to supporting institutions and the costs of operating and maintaining the facilities.

--Notwithstanding agreements and certifications required by the Foreign Assistance Act, as amended, recipient countries did not provide adequate recurring cost support.

--Users should have been involved in the design process to promote a sense of responsibility for operating and maintaining the systems.

--Assumptions concerning the establishment of user organizations to provide maintenance, ensure equitable distribution, and maintain discipline were not realized. As a result, the systems were vandalized, water was wasted or stolen, and routine maintenance was ignored.

We made recommendations to solve the problems, and AID generally agreed with the thrust of the report. Appendix I is the digest from the report.

CONCLUSIONS

The proper upkeep of water and sanitation facilities is not a new area of concern for AID. The Agency has studied the problem, developed a framework of what constitutes an adequate program, and identified the elements leading to success. The design of the projects we reviewed included an operation and

[1] Irrigation Assistance to Developing Countries Should Require Stronger Commitments to Operation and Maintenance (GAO/NSIAD-83-31, August 29, 1983).

maintenance component. However, this activity was not fully implemented, or the financial resources, trained personnel, and health education which foster proper upkeep were not pursued, thereby, developing the local, regional and national institutions to carry the programs forward.

Water projects should, where feasible, be self-supporting. In Indonesia, all user fees could not be collected because of broken meters, inaccurate readings and unauthorized connections. In Peru, user fees were not being fully collected, or were not adequate to ensure the financial viability of the projects. Elsewhere, older systems are failing faster than new construction, because of limited support for proper operation and maintenance as is the case in Tanzania. As a result, the population being served has declined in that country.

Trained personnel are needed to construct, monitor, operate, maintain and repair the systems. Indonesia lacked the personnel to repair the system and stem the serious loss of water. At the time of our review, training was not an active part of the project in Peru. The lack of local concern, however, can also hinder upkeep of the facilities--as the project official observed in Tanzania. Community participation can help fill this gap as it did in Malawi. Our review of the irrigation projects also noted the value of community involvement.

Health education is intended, in part, to inform the users of the benefits to be realized by the continued availability of water and sanitation services, thus promoting upkeep. Neglect of this component can lead to misuse of the facilities as it did in Indonesia. This component should also be coordinated with the installation of the facilities, which was not the case in Peru. The project in Tanzania did not have a health education component.

Experience has demonstrated that operation and maintenance is one of the most troublesome components of potable water supply and sanitation projects, as well as irrigation projects. We believe that there are two reasons for this problem. First, during implementation, the immediate need is to overcome the administrative and operational impediments to the timely delivery of water and sanitation services. The host country implementing agency, contractor, or PVO must be brought "on line," equipment and supplies must be ordered and delivered, and construction must begin at the sites. From an AID project management perspective, priority is naturally given to these immediate problems. Second, a sound operation and maintenance program requires a high level of resolve and support from a wide range of people and organizations. The institutionalization of rural water and sanitation services has been a long-standing need, but a relatively new priority for many developing countries. Therefore, the resources must be marshaled, personnel must be trained, and the users must be educated.

We realize that this can be a lengthy process. However, we also believe that the development of an operation and maintenance capability is as important as the delivery of water and sanitation services. This component, therefore, should be given the same priority as the intended delivery of the facilities. We believe our review of U.S.-supported irrigation systems also shows that proper operation and maintenance is a widespread and serious problem which needs more attention.

RECOMMENDATION

We, therefore, recommend that the Administrator, AID, direct that:

--Operation and maintenance be given the same priority as construction of water supply and sanitation systems by implementing upkeep activities in tandem with the installation of the facilities. The operation and maintenance component should provide for (1) adequate resources to meet recurring costs, (2) trained personnel to ensure the continued delivery of the intended level of service, and (3) user health education to promote continued upkeep. Inherent in such a program is the need to develop the institutional support necessary to carry these activities forward.

AGENCY COMMENTS

AID agreed with the thrust of our recommendation. However, the Agency stated that health education activities do not automatically bring about the desired changes in traditional beliefs and behavior, including improved maintenance. Proper water use and upkeep can also be fostered by other factors, including improved quality, quantity, reliability and convenience of the supplies. According to AID, the inclusion of health education activities in a particular project should be based on the merits for the case. The Agency also noted the similarity of maintenance problems in potable water supply and irrigation projects.

CHAPTER 4

MEASURING WATER QUALITY, QUANTITY AND IMPROVED HEALTH

In addition to promoting overall social and economic progress, another major objective of U.S. support of rural water supply activities is to prevent disease and improve health. To achieve this goal, the water should be relatively free from contamination. It should also be convenient, reliable, and sufficient to satisfy minimum needs for drinking, food preparation, hygiene, and other uses.

The health-related goal of AID's potable water projects leads to the following question:

--Are the projects providing safer water in greater quantities than previously available to the target populations?

WHO recognizes that logistical constraints and the lack of adequate laboratory facilities in many developing countries allow only a minimum level of testing for those elements which measure water quality. We found this to be the case in the countries we visited. The bacteriological quality of the water, an important indicator of immediate health hazards, is not being widely examined. The water, however, is being drawn from remote sources which minimizes the risk of contamination. Sanitary surveys, which WHO recommends as a minimum level of control, are not being aggressively pursued as part of the AID project implementation process.

Based on our observations and discussions with project officials and users of completed systems, there now appears to be a greater, more convenient and reliable supply of water. However, information is not routinely collected concerning how the AID-assisted projects are expanding access to this basic service over the traditional sources of water used by the individual communities. Even if this information is only accumulated during a sanitary survey when the systems are inaugurated, it would be helpful in assessing the potential for the projects to contribute to the aim of this type of assistance.

QUALITY IS NOT BEING FULLY TESTED

An important parameter of drinking water quality is the bacteriological content. Water can be examined for specific types of indicator organisms which show contamination from human or animal waste. Chemical analysis will tell if the water is free from toxic substances, such as pesticides and other inorganic material, which affect health. Other chemical-related characteristics are not directly related to health, but affect the color, taste, and odor which help determine whether people are willing to use the water. In this respect, physical analysis can assist in determining an acceptable source of supply.

There are no routine bacteriological tests of the water being provided through the AID-assisted projects in Ecuador, Malawi, Peru, or Tanzania. Indicators of chemical and physical quality are also not being fully analyzed. For sanitary quality, most projects rely on an uncontaminated source of supply. For example,

--In Ecuador, there are no tests for bacteriological quality, unless there is an obvious source of contamination. Chlorination, however is a widely practiced precautionary measure. When the source of supply is mountain springs, only on-site visual and taste tests are performed by project officials. The chemical quality of rural supplies is partially tested prior to construction of the systems. Based on our review of laboratory records, water is not being tested for several chemical pollutants for which the country has adopted a maximum acceptable limit. The water is not tested for quality after the systems are constructed.

--In Malawi, there are no tests of water quality. Supplies are usually drawn from remote mountain sources which government officials consider sanitary.

--In Peru, the water is generally tested for physical and chemical quality before the systems are inaugurated. We received conflicting information concerning analyses for sanitary quality. We found no evidence of such tests. Supplies, however, are drawn from remote sources.

--In Tanzania, well water is tested for fluoride and salt content at the time of construction. There are no tests, however, for sanitary quality. We observed that wells are generally more protected than the traditional sources of supply.

Project and host country officials cited the lack of timely transportation and adequate laboratory facilities as impediments to bacteriological analyses. Portable test kits are available for use in remote areas. The projects in Ecuador, Malawi, and Peru provided funds for such equipment. None, however, were in use at the time of our review.

Based on our site visits, the sanitary quality of the water is probably better than the traditional sources. The projects tap remote springs and streams, and villagers no longer must rely on nearby polluted rivers, streams, and unprotected sources for supply.

QUANTITY IS NOT BEING MEASURED

The quantity of water being delivered by the AID-assisted projects, and the amount being consumed by the target beneficiaries, is unknown. The projects in Ecuador, Indonesia, Malawi, and Peru are, however, designed to provide at least the minimum quantity needed to meet basic needs. For example,

--In Ecuador, the systems are intended to accommodate present and future demands. Based on our calculations, we estimate that the quantity of water being provided to the project communities now exceeds the country's standards.

--In Indonesia, the system has achieved the intended overall rate of water flow. Leaks and broken meters, however, make it impossible to determine the quantity of water reaching the consumers.

--In Malawi, the systems are also designed to meet present and future demands, including the agriculture needs of the surrounding areas. During site visits, we observed an adequate flow of water.

--In Peru, we were told by project officials that all sites are tested before construction to ensure an adequate supply of water to meet the intended flow. During site visits, we also observed an adequate flow of water.

In Tanzania, we visited 12 sites where pumps were installed with AID assistance. At five sites, there were deficiencies: one well produced water unfit for consumption; one well was dry; two wells provided intermittent service; and one well was missing the pump. The functioning wells serve larger populations than intended. As originally designed, each pump was to provide water for 250 to 400 people. Based on our analysis, each pump is used by an average of 1,100 villagers.

PROVIDING SAFE WATER

WHO has been a leader in establishing standards and guidelines for assessing water quality. According to that organization, bacteriological and physical quality are the most important considerations in the case of rural supplies. According to WHO, "safe" implies no bacteriological pollution and an acceptable level of physical properties.

The consequences of contaminated water point to the need for a measure of control. In this respect, according to WHO, laboratory analyses and sanitary surveys are important measures

for ensuring the quality of water. Rigid testing is often not feasible, however, because of the lack of adequate facilities, trained personnel, timely transportation, and other constraints. Recognizing these impediments, WHO recommends that sanitary surveys be conducted to ensure the best conditions for providing safe water in remote areas.

A practical approach: the sanitary survey

Sanitary surveys can assist in determining if the source, treatment, storage, and distribution of the water presents a health hazard to the consumer. Ideally, such surveys examine the engineering integrity of the system, the quality of the water, and the capacity of the supporting institutions to properly operate and maintain the facilities. Other survey activities can include training and health education, and stimulate remedial action and improvements. According to WHO, the most important survey is during the development of new sources of supply. These should determine the suitability of the source, and the treatment which may be required before the water can be considered safe for consumption. The level of laboratory analysis depends on the available resources. WHO's guiding principle is that "no new public water supply should be approved without a sanitary survey made, or accepted by an agency with surveillance responsibility." Also, according to AID, the importance of the survey "cannot be over-emphasized."

Because of the large number of rural and village-level water supplies in developing countries, surveys are usually conducted by a sanitary aid. WHO has provided a guide[1] for this level of surveillance. The guide is useful for identifying and solving the types of problems common to rural water systems. The guide provides a series of checklists for various types of water systems and emphasizes the need for (1) proper installation, (2) protection from contamination, and (3) proper drainage.

In conjunction with sanitary surveys, an inventory of water supplies is important for determining which sources are in use, their limitations, and problems which may need priority attention. The WHO guide also provides a simple format for such an inventory. The information to be collected, includes, for example, the

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[1]Rajagopalan, S. and Shiffman, M.A. Guide to simple sanitary measures for the control of enteric diseases. Geneva, World Health Organization, 1974.

--name and location of the community;

--population;

--available means of communication and transportation;

--sources of water supply and the level of protection;

--methods of treatment, transmission, storage, and distribution; and

--water disposal practices and facilities.

WHO recommends that the inventory be supplemented by other data, whenever possible, such as the number of household water supply connections. The inventory should be updated annually. None of the projects we visited were conducting the type of survey suggested by WHO.

MEASURING IMPROVED HEALTH

AID supported a recent review[2] of the relationship between water and health. In that review, a discussion of the impact of community water supplies and health summarizes numerous studies by WHO, donor organizations, and private researchers and concludes, in part, that

--there is a significant body of evidence which supports the positive linkage between sanitary water supply, proper sanitation, and long-term improvements in health;

--the present state-of-the-art makes it difficult if not impossible to predict accurately the improvement in health which can be expected with improvements in water supply and sanitation;

--after-the-fact measurements present formidable problems and require considerable resources;

--the major direct beneficiaries are young children and the poorer members of society;

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[2]Water and Human Health, U.S. Agency for International Development, National Demonstration Water Project, July 1982.

--water quantity, as well as quality, is an important factor in establishing health benefits;

--the qualitative evaluation of the health benefits of water supply projects and programs is impractical as a routine activity and should be limited to research projects with substantial resources; and

--water supplies which are adequate in quality, quantity, reliability and convenience must be used if these interventions are to be effective as a health measure.

During May and June 1982, WASH provided technical assistance to review the AID-assisted Rural Sanitation Project in Bolivia. The report[3] notes the frequent use of health benefits to justify water and sanitation projects. It also notes that the relationship is difficult to measure. Therefore, projects cannot be evaluated solely on this basis.

The report recommends that evaluations of project impacts should include an assessment of immediately quantifiable and identifiable changes. According to WASH, changes which should be considered include the

--distance the water is carried (convenience);

--quality of water delivered;

--consumption;

--number of users;

--percent and number of successful systems 1, 3, and 5 years after completion (reliability); and

--observations of water and sanitation practices before and after the project.

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[3]Reprogramming of the Rural Sanitation Project in Bolivia, WASH, Field Report No. 47, August 1982.

The WASH report also suggests an assessment of the financial and institutional issues brought about by this type of project. The report, therefore, emphasizes the need to observe changes in the quality, quantity, convenience and reliability of the services before attempting to establish the elusive relationship between safe water, improved sanitation, and better health.

The Provincial Water Project in the Philippines is attempting to use such an approach. AID funds are supporting a baseline study, interim report, and final evaluation intended to measure performance and other improvements. The studies are being implemented by the U.S. Bureau of the Census.

The interim report[4] examines the performance and short-term effects of the project, and seeks answers to the following questions:

--Has there been an improvement in the availability of water?

--Are the systems meeting the needs of the population?

--Are the systems operating efficiently?

--Have there been any changes in the patterns of water usage?

--Has water quality improved?

According to a Bureau of the Census official, this type of evaluation focuses on immediate and quantifiable variables. The rural health-related projects which were the focus of this review rely on a measurable improvement in health as an indicator of long-term success. For example, the

--Integrated Rural Health Delivery System Project in Ecuador intends to achieve "Statistically significant decreases in morbidity . . . and mortality, especially among mothers and children under 5 . . .";

--Self-Help Rural Water Supply Project in Malawi intends a "Reduction of water-related diseases among rural villagers"; and

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[4] Provincial Water Project Evaluation Interim Monitoring Survey Results, U.S. Bureau of the Census, January 1983.

--Rural Water Systems and Environmental Sanitation Project in Peru intends to have "Infant mortality reduced by 20 percent."

As discussed above, however, the projects are not measuring the immediate and quantifiable changes essential to improved health.

CONCLUSIONS

Rural potable water supply projects and related sanitation activities are aimed at improving the health of the intended beneficiaries. Improvements in the quality and quantity of the water are important factors in achieving health benefits, and reducing the spread of numerous diseases.

Based on our observations and discussions, we believe that the quality and quantity of water being provided through the AID-assisted projects is likely to be an improvement over the traditional sources of supply. Water is being drawn from areas which are generally considered to be relatively free from contamination. Also, the projects are being designed to deliver at least the minimum amount of water considered necessary for healthy living.

We note, however, that AID is not routinely assessing the immediately quantifiable changes resulting from the projects. We believe there is a need to measure the essential links to improved health. The sanitary survey can be a useful mechanism in identifying these changes. We agree with WHO that, as a minimum, such a survey should be completed and approved by a responsible official at least when the systems are inaugurated. The surveys can also alert system operators and program managers of the need to eliminate defects and improve the quality and quantity of the water. If properly designed and implemented, the surveys could also be an initial step in compiling important information which AID now lacks concerning the improved quality, quantity, convenience and reliability of the supplies.

Many developing countries do not have the capacity to test the sanitary quality of rural water supplies. Portable test equipment, however, is available for use in these areas. AID has provided funds for these kits, but none were being utilized in the projects we reviewed. We believe that the procurement and use of this equipment should be given the same priority as other commodities--transportation equipment, pipe and pumps--particularly considering the health-related goals of the projects. In those instances where it is not feasible to ascertain the bacteriological quality of the water using existing test facilities or portable equipment, a comprehensive sanitary survey could provide a minimum level of assurance that the location, construction and operation of the systems minimize the subsequent opportunities for contamination.

We believe the projects are overly optimistic in attempting to evaluate a quantifiable improvement in health. Numerous studies have attempted to analyze this change and produced conflicting or questionable results. Before attempting to evaluate the health impact of potable water supply projects, we believe it would be helpful for AID to first establish that the projects are delivering the means to achieve this goal. We concur in the widely held belief that a safe and adequate water supply generally results in a healthier population. We believe that AID can rely on this assumption, if AID can demonstrate it has provided an improved source of supply.

RECOMMENDATIONS

We, therefore, recommend that the Administrator, AID, direct that:

--Changes in the quality, quantity, reliability and convenience of the water be identified at least when the systems are inaugurated. This could be accomplished through the use of (1) portable test equipment to measure improved sanitary quality, and (2) sanitary surveys to also identify improvements in the quantity, reliability and convenience of the water over the traditional sources of supply. The format of the surveys should be standardized throughout the agency to emphasize the importance of this activity, and promote the pursuit of this type of surveillance.

--Project goals and periodic evaluations stress the importance of providing a clean, adequate, continuous and accessible supply of water as a <u>means</u> to improved health. Achieving these improvements could be an objective and identifiable measure of successful projects. The agency should pursue the health impact of water and sanitation projects on a case-by-case basis where the circumstances particularly merit the expenditure of resources for this purpose.

AGENCY COMMENTS

AID agreed that sanitary surveys are practical and useful. The Agency will prepare and distribute guidelines for this purpose. Water quality issues will also be addressed.

AID concurred with our belief that project evaluations should first establish that the systems are delivering the means to better health--a safe and adequate supply of water. However, the Agency commented that evaluations such as those of the Rural Sanitation Project in Bolivia and the Provincial Water Project

in the Philippines are expensive and lessons learned may not have broad application. They also stated that it would be desirable but impractical to identify successful projects 5 years after the completion of project activities.

U.S. GENERAL ACCOUNTING OFFICE REPORT TO THE ADMINISTRATOR, AGENCY FOR INTERNATIONAL DEVELOPMENT

IRRIGATION ASSISTANCE TO DEVELOPING COUNTRIES SHOULD REQUIRE STRONGER COMMITMENTS TO OPERATION AND MAINTENANCE

D I G E S T

Poor operation and maintenance (O&M) practices are seriously limiting the efficiency of donor-assisted irrigation systems in developing countries. Operation and maintenance includes the management of water supplies to the end users and the upkeep of system facilities. Systems often require extensive rehabilitation because of neglect after only a few years of operation. The pervasiveness of the O&M problem represents an increasingly important issue to the Agency for International Development (AID) and other donor agencies that plan additional investments in irrigation estimated to total billions of dollars. (See pp. 1 and 2.)

GAO made this review to determine how AID can (1) improve O&M practices of developing countries and extend the economic life of U.S.-financed irrigation systems and (2) design irrigation projects that adequately consider O&M requirements. GAO examined operation and maintenance for AID projects in Indonesia, Sri Lanka, and Thailand, where AID and the host countries are jointly financing over $700 million in ongoing and recently completed irrigation development. GAO also considered the reported conditions affecting World Bank and Asian Development Bank projects. The United States contributes to both organizations, which have substantial irrigation investments. (See p. 3.)

Effective operation and maintenance requires a commitment by both the aid recipient and the donor. GAO found several problems affecting the performance of irrigation systems in each country visited, which raises questions concerning the level of capability and commitment that actually exists.

RECURRENT COSTS ARE NOT BEING MET

Donors have demonstrated their concern with developing country food problems through

investing in irrigation systems and other facilities. At the same time, they have not given sufficient attention to the complementary institutional and financial costs of operating and maintaining the facilities.

Donors have assumed that recipient countries would provide recurrent budget support to effectively operate and maintain projects, but this has not happened. For example, AID project loan agreements have specified that recipient countries will provide adequate O&M funding. And as required by Section 611(e) of the Foreign Assistance Act, AID has certified that these countries have the economic and human resources to operate and maintain specific irrigation projects. Notwithstanding such agreements and certifications, recipient countries have not provided adequate recurrent cost support and recipients and donors continue to invest in rehabilitating neglected systems and in new systems. (See pp. 10 through 18.)

AID has prepared a policy on recurrent cost financing, but the World Bank and Asian Development Bank have not. Donors need to define their policies toward recurrent cost financing to aid them in working together on the O&M problem. (See pp. 18 through 22.)

GAO believes that institutional as well as financial weaknesses affect recipient countries' ability to effectively use and maintain irrigation systems. AID should give more attention to these needs as part of its assistance to the irrigation sector. Many irrigation systems do not provide reliable water sources and have not become self sustaining. By addressing institutional and financial constraints, AID assistance should help to achieve the development of self-sustaining irrigation systems.

As a possible source of O&M funds in selective situations, the Administrator should examine the feasibility of using Public Law 480-generated currencies for operation and maintenance on a short term basis. Such selective use of generated local currencies should help to integrate Public Law 480 programs with development assistance programs and to improve

recipient country self-help measures--objectives sought by AID and the Congress. (See pp. 20 through 22.)

RECOMMENDATIONS

AID should strengthen the project planning, loan agreement, and section 611(e) certification process as a serious mechanism for establishing recipient country capability, willingness, and commitment to operation and maintenance. To do this, GAO recommends that the Administrator of AID:

--As a condition for AID project approval, require a recurrent cost financial plan for each irrigation project, to include annual life-of-system O&M cost estimates and how such costs will be financed; also required should be plans to strengthen budgeting and accounting, if needed, and to establish an institutional capability for implementation and monitoring.

--Encourage other donors to further define their policies toward recurrent cost financing. (See pp. 22 through 23.)

DESIGN AND CONSTRUCTION IMPROVEMENTS CAN REDUCE O&M COSTS

Weaknesses in system design and supervision of the design process reduce the efficiency of irrigation systems and directly increase O&M costs. Adequate consideration of O&M requirements, such as need for canal linings and strengthened quality control over the design process, can reduce O&M costs over the life of the system. Local farmers should be involved early in the design process, to promote a sense of responsibility for on-farm operation and maintenance, and donors should support a transition period after construction, to assure that systems operate properly and that adequate O&M programs are established.

Failure to remove debris from soil and inadequate soil compaction have increased O&M costs, because canals and other structures have rapidly deteriorated and greater water conveyance losses occur. In some instances, facilities have had to be repaired or improved before they could be used. (See pp. 25 through 33.)

RECOMMENDATION

GAO recommends that the Administrator of AID adopt stronger irrigation system design and construction criteria, addressing quality assurance control, involvement of local farmers, O&M requirements, and a transition period after construction. (See p. 34.)

WATER USER ASSOCIATIONS--
AN ELUSIVE GOAL

AID project designs have assumed that water user associations would be established and provide on-farm maintenance, ensure equitable water distribution, and maintain discipline among users. Generally these assumptions were not realized. Consequently, irrigation systems had been vandalized, water wasted or stolen, and routine maintenance ignored. (See pp. 36 through 40.)

RECOMMENDATION

GAO recommends that the Administrator of AID adopt specific provisions in project designs and loan agreements to promote successful farmer organizations. Before financing irrigation construction, AID should require evidence from the host country that active associations have been established, want the system, and have accepted responsibility for on-farm operation and maintenance. (See p. 41.)

AGENCY COMMENTS

AID agreed that more attention must be given to the financial and institutional costs associated with operation and maintenance over the life of U.S.-financed irrigation systems. Its comments indicated agreement with the thrust of GAO's recommendations. However, AID did not say how it would implement them. (See pp. 23, 34, 41, and app. II.)

AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

DEC 15 1983

SENIOR ASSISTANT ADMINISTRATOR

Mr. Frank C. Conahan
Director
National Security and
International Affairs Division
United States General Accounting Office
Washington, D.C. 20548

Re: Agency for International Development (A.I.D.) Comments on the GAO Draft Report: "Meeting a Basic Human Need: A.I.D.'s Rural Potable Water and Sanitation Program (472003)", dated Nov. 4, 1983

Dear Mr. Conahan:

Enclosed herewith are our comments on statements of fact, policy, and interpretation in the subject report. The report was circulated to our regional bureaus and this communication is our consolidated response.

The report's findings are, in general, consistent with the Agency's experience with rural potable water and distribution projects. This experience is reflected in our own documents, including:

A.I.D. Policy Paper, "Domestic Water and Sanitation", May, 1982

"Water Supply and Sanitation for the Decade (1980-1990)", July, 1979

"Community Water Supply in Developing Countries: Lessons from Experience", Sept., 1982

"Report of Evaluation of the Water and Sanitation for Health Projects", August, 1983

The GAO report provides a comprehensive list of implementation problems in A.I.D.'s water supply and sanitation projects. The GAO's recommendations focus on implementation problems common to projects in many sectors, e.g., procurement, realistic scheduling, institutional development, recurrent costs, operation and

maintenance, training, et al. The Agency is moving in the water and sanitation sector and in other sectors to strengthen the "software" aspects of its development projects. The GAO report offers good guidelines for the water and sanitation subsector.

More specific comments are provided in the enclosures.

Sincerely,

N. C. Brady
Senior Assistant Administrator
for Science and Technology

Enclosures:

1. Specific Comments on Draft GAO Report (472003)
2. Response to GAO Analyses of Specific Country Projects
3. USAID/Lima Response to Draft GAO Report GAO/ID-83-42

GAO note: Enclosure 3 of this letter was reproduced as appendix 3 of GAO/ID-83-42 and is, therefore, not being included as part of this report.

Attachment 1

Specific Comments

Cover Summary: par. 1, line 2 "...affect millions of lives..." (WHO Statistics) and line 4 "...for over 40 years..." (A.I.D. (now line 2) predecessor organizations dating to 1942).

(now p. ii, par. 5)
Page iv, par. 2: For balanced presentation the favorable review of the Ecuadorian and Malawian projects might be expanded to "equal time", i.e., a short paragraph for each.

(now p. iii, par. 2)
Page iv, last par., suggest "...(2) trained personnel..." and (3) "... to promote proper use and upkeep."

(now p. iii, par. 5)
Page vi, par. 1: Although an understanding of the relationship between safe water, improved sanitation practices, and health is important, it is difficult to bring about this change in belief and behavior through health education programs - especially as traditionally conceived and implemented. To the extent that health education occurs, it is generally on a periodic basis by Government extension workers who use a lecture approach. The villagers may listen attentively and then continue with business as usual. Simply telling people that one source of water is "safer" than another, or trying to influence behavior by teaching the germ theory is difficult. It may be best to try to design systems which respond to other factors which influence use, such as taste and convenience, and provide sanitary protection.

(now p. iv. par. 2)
Page vi, par. 2: Concur that many of the same managerial problems that hinder upkeep of drinking water facilities are often found in irrigation projects.

(now p. iv, par. 3)
Page vii, par. 1: Water quality issues described are addressed in the "A.I.D. Domestic Water and Sanitation Paper", and more fully in the panel report on "Water Supply and Sanitation for the Decade". A.I.D. (through S&T/H/WS) will seek to reduce the information on this issue in these documents to digestible size and transmit it to the field. A.I.D. will also prepare and distribute to the field practical information on sanitary surveys for source of drinking water.

(now p. iv, last par.) (now p. v, par. 1)
Page vii, last par. and page viii, par. 1: A.I.D. generally concurs with use of basic indicators for evaluation.

(now p. v)
Page viii, "Conclusions": A.I.D. concurs in the need for reasonable implementation schedules, the importance of continued operation and maintenance, identification and prevention of immediate health hazards, and the use of measurable, immediate, evaluation indicators.

(now p. v)
Page ix, "Recommendations": The recommendations presented are reasonable, useful, and generally consistent with A.I.D. policies promulgated in May 1982. (See "A.I.D. Policy Paper, Domestic Water and Sanitation"). Line 19 might be modified to read "...installation and maintenance activities". On page x, (now p. vi it might be noted in this subsector recent examples of training components include Peru, Thailand, Sri Lanka, and the Near East. The Water and Sanitation for Health (WASH) Project is now field testing "generic" training modules for several major topics in rural water supply and sanitation, e.g., construction of latrines. A.I.D. has also recently published an extensive series of short technical notes suitable for training use at field level.

(now p. vi)
Page x, last paragraph. The Science and Technology Bureau's Office of Health will prepare a working guideline manual suitable for field use in "sanitary surveys to identify changes in the quality, quantity, reliability and convenience of the improved supplies of water.

(now p. 2)
Page 1 and ff, including page 3. Perhaps worth noting is that the WHO statistics do not include China.

(now lines 2 and 5)
Page 2, lines 16 and 19. "Water hygiene" might be more understandable than "water washed" diseases to the general reader. Also page 3, line 2. (now p. 2, line 14)

(now line 11)
Page 2, line 25: Schistosomiasis, transmitted by snails, would be more accurate nomenclature than "snail fever".

(now p. 2, par. 4, line 2)
Page 4, line 2: U.S. involvement dates back to the Institute of Inter-American Affairs during World War II, i.e., over 40 years.

(now p. 4, par. 4)
Page 7, par. 1. Economic Support Funds have financed water supplies in some rural areas also, e.g., USAID/Cairo's Basic Village Services Project.

(now p. 5, par. 2)
Page 7, par. 2. Refers to non-ESF projects? DA funds are being used in Latin America and in Asia as well as in Africa. Africa generally has more projects but of smaller average size.

(now p. 6, par. 1, lines 4-7)
Page 8, par. 2, lines 14-17. Relative per capita cost of death avertion depends on specific cases, especially for water supply. The low per capita capital and recurring costs for the Malawi project are noteworthy and are included herein in the response to GAO's Malawi findings.

(now p. 9, line 3)
Page 13, last line. Suggest revised wording: "... projects ... are not yet delivering".

(now p. 10-23)
Pages 14-34. Attachment 2 reviews each country individually.

(now p. 25, 2nd sentence)
Page 35, 2nd sentence. "...many donor financed systems... are inoperable." Even more locally financed systems are inoperable. Operation and maintenance problems are not necessarily a function of the source of funds.

(now p. 27, par. 6)
Page 39, par. 1. The statement that A.I.D. "supports about half the national budget for these activities" implies that A.I.D. is paying for recurrent costs. Is this what is meant? Or does GAO mean that the USAID/Lilongwe water project grants each year for capital development are equal to about half the total national budget for the sector?

(now p. 30)
Page 41, Health Education Section

The GAO draft report appears to assume that health education will lead to improved maintenance performance, an implicit assumption that health education leads to changed beliefs which result in changed behavior. This is not automatic - witness, for example, continued smoking of tobacco! Unfortunately, many health education programs as traditionally conceived and implemented - especially lecture approaches and recitation of germ theories to illiterates are ineffective. Water use - and maintenance - can also be motivated by other factors which influence behavior: taste, ease and convenience, reliability, waiting lines, distance, cost, available quantity, literacy, pride, even superstition. Other things being equal, health education is desirable and may have health benefits beyond those associated with the water supply. However its inclusion in a particular project should be based on its merits for that case. GAO may wish to modify or amplify this section of the draft report.

(now p. 30, lines 44 and 45)
Page 42, lines 16 and 17. See above.

(now p. 32)
Page 43. GAO Review of Irrigation System

A.I.D. has also noted the similarity of maintenance problems of drinking water supply and of irrigation projects. See A.I.D. Program Evaluation Report No. 8, "Irrigation and AID's Experience Based on Evaluations", August 1983.

(now p. 34)
Page 47. Recommendation on operation and maintenance. A.I.D. agrees with the importance of operation and maintenance. (See A.I.D. Policy Paper, "Domestic Water and Sanitation, May 1982).

Chapter 4, 1st paragraph, et al. As written this paragraph could be interpreted to imply that A.I.D.'s sole purpose for supporting water supply projects is improved health. Health is

indeed one of the major objectives. Objectives include economic development, increased human productivity, income-generation, time saving, improved lives for women and children, income redistribution, et al. Also indirect benefits (gardening, animal husbandry, village industry, et al.) can be important in the aggregate.
(now pp. 38 and 39)
Pages 53-55. Sanitary Survey. A.I.D. concurs in the practicality and usefulness of the sanitary survey.
(now p. 38)
Page 54. Is Rajagopalan the appropriate reference? Suggest:

World Health Organization. "Surveillance of Drinking Water Quality", Geneva. 135 pp. 1976.

(now p. 40)
Page 56, sentence on lines 16-18, "...changes have rarely, if ever, been observed." This unsupported statement is totally at variance with reference 2, page 55, which reviews over 200 scientific studies of the issues. (reference 2 now on p. 39)
(now p. 40, line 28)
Page 57, line 2. "5 years after completion" would be desirable but impractical for A.I.D. programs.
(now p. 41)
Page 57, paragraph "The WASH Report...". And following par. "The Provincial Water Project...". Such evaluations are expensive and should be done only as research projects and or on a small sample of projects. Also, their conclusions are difficult to transfer to other projects. Par. 2 on page 60 is a realistic approach. Also the last sentence on page 61. (now p. 43)
(now p. 43) (par. 2, p. 60 now par. 1 p. 43)
Page 61. The Science and Technology Bureau's Office of Health will prepare and distribute technical guidelines for sanitary surveys to all regional bureaus and field missions.

Attachment 2

Response to GAO Analyses of Specific Country Projects

GAO teams visited seven A.I.D.-assisted projects in five countries: Ecuador and Peru in Latin America, Tanzania and Malawi in Africa, and Indonesia in Asia.

Ecuador

The Agency concurs with the GAO findings on the Ecuadorian project. The LAC Bureau intends to send copies of the Ecuador Project Paper to its Missions as a model project in terms of design and implementation. It should be noted that this project has had, from its inception, a full time sanitary engineer assigned to it by USAID/Quito.

Peru

This project has had implementation delays as noted in GAO's earlier report (GAO/ID-83-42, July 2, 1983). The attached table updates the status of the Project (527-0221) as of September, 1983. Perhaps the most important changes are the assignment of a full time sanitary engineer to the project and increased decentralization by the GOP.

A copy of USAID/Peru's response to the draft of GAO's earlier report is attached for the record. (See Attachment 3)

Status of Peru Project (as of Sept. 1983)*

Systems installed	26
Systems under construction	5
Systems under design	40
Regions with activities	6
Warehouses completed (Cajamarca and Ancash)	2
Warehouses in construction (Huancayo, Piura, Trujillo and Cuzco)	4
Bids contracted for local procurement of pipe and accessories	$465,000
Arrival of Salvador Reyes, sanitary engineer on PASA from U.S. Indian Health Service	5 Sept 83
DISAR regional engineers	
on board Sept., 1983	2
Contracted with in Sept., 1983	8
Total	10
Training Courses, Sept. - Oct., 1983	
for engineers	10
sanitary technicians	28
and health auxiliaries and sanitary technicians	226
- Design	
- Construction	
- Operations and maintenance	
- Management, operation and maintenance for rural courses	
Status of GOP meeting conditions precedent	100%
Status of 1983 operational plans and approved budget	29 Aug 83
Dollars released for implementation of Plans	$1,357,470
Project vehicles	
Now available	7
expected in November	2
to be procured	6

*Rural Water Systems and Environmental Sanitation Project (527-0221)

Tanzania

(now p. 19, par. 3)
Page 28, par. 1: Note that the project ended June 30, 1983. The project had a total life of project funding of $19.3 million, not $21 million as shown in the draft report. $14.5 million was from AID, $4.8 million from the GOT. (Note: reduction in the GOT contribution was based on the discovery of a calculating error at the beginning of the project, corrected by Project Amendment No. 7). The GOT contribution to the water component was $190,000, most of which was in kind.
(now p. 21)
Page 30: Mbugwe and Masai Projects: late ordering of commodities and logistical problems impacted adversely on these two projects.
(now p. 25)
Page 35: Recurring costs is a major issue. GAO's comment on the GOT's failure to respond adequately to this need reflects the GOT's present economic problems. (Tanzania is currently under the prohibitions of FAA 620(q) and the Brooke Amendment, Section 517 of the Appropriations Act.)

Malawi

As noted by GAO, Malawi's A.I.D.-assisted rural water supply project has been highly sucessful. A.I.D.'s own recent evaluation of this project, undertaken by S&T's Water and Sanitation for Health (WASH) project confirms the GAO's findings. The WASH evaluation also served, in part, as a field test of the World Health Organization's Minimum Evaluation Procedures (MEP) for water and sanitation projects. This project has been cited in World Bank's report, "Accelerated Development in Sub-Saharan Africa" as an example of a successful self-help scheme.

The Malawi rural water supply project is an excellent example of the "art of the possible" with limited resources. Appropriate technology and broad-based community support and participation have made possible a much improved water system in a poor country. Untrained villagers provide the labor required to lay pipes for these gravity-flow water systems, while other volunteer villagers are given two weeks training in system maintenance and repair. Because of the Malawi Government's commitment and the villagers' own sense of pride and ownership in the projects, an extremely high level of maintenance is achieved. The following cost data are illustrative.

Cost Data for USAID-Assisted Malawi Water Supply Project

Item	U.S. (or Equiv).	Percent of Total
U.S. Contribution ($)	$5,316,000	65%
GOM Contribution (Kwacha)	367,000	5%
Self-help Contribution (1.6 million man days)	1,633,000	20%
Other Donors (Japanese pipe)	870,000	10%
Total Costs and Percent	$8,236,000	100%
Population	460,000	
Capital Cost per Capita	$ 17.90/capita	
*Recurring Costs	$ 0.20/capita/year	

Since the GAO team visited Malawi, the health education and sanitation promotion campaign has been strengthened. Some 70 field workers have been trained to and are working to form or revitalize village health committees in over 1,500 target villages over the next three years. Another 50 field workers will be trained during 1984.

Further, a recent survey of Mulanje District found that over 97% of the taps were producing water. The others were awaiting repair parts or were in the process of being repaired.

Indonesia

The problems outlined in this project, i.e., inadequate operation and maintenance, high leakage, procurement and implementation delays, et al., reflect inadequate institutional development within the host government's implementing agencies. Recent development of new water projects by the Asia Bureau, specifically in Thailand and Sri Lanka, has strongly emphasized institutional development as a major goal.

Because the two A.I.D. engineers in the project are no longer in USAID/Jakarta, we cannot in the time available verify the accuracy of the statistics in paragraph one on page iii and on page 23; on education on p. vi; on leakage on pp. 39 and 3; on latrines and bathhouses and on education on p. 41, par. 4. However we have no reason to assume that they are not valid. (par. 1, p. iii; p. 23; vi, pp. 39 and 3; and p. 41, par. 4 now par. 2, p. ii; p. 17; p. iii, pp. 29 and 2; and p. 30, par. 4, respectively)

*Based on analysis of 10 projects serving 300,000 population in Mulanje District. Includes GOM salaries, transport and materials; contributed labor and materials; but does not include amortization.

(472003)

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