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WATER AND SANITATION
FOR HEALTH PROJECT

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# MALAWI SELF-HELP RURAL WATER SUPPLY PROGRAM: FINAL EVALUATION

## WASH FIELD REPORT NO. 186

AUGUST 1986

Prepared for
the USAID Mission to the Republic of Malawi
WASH Activity No. 235

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by

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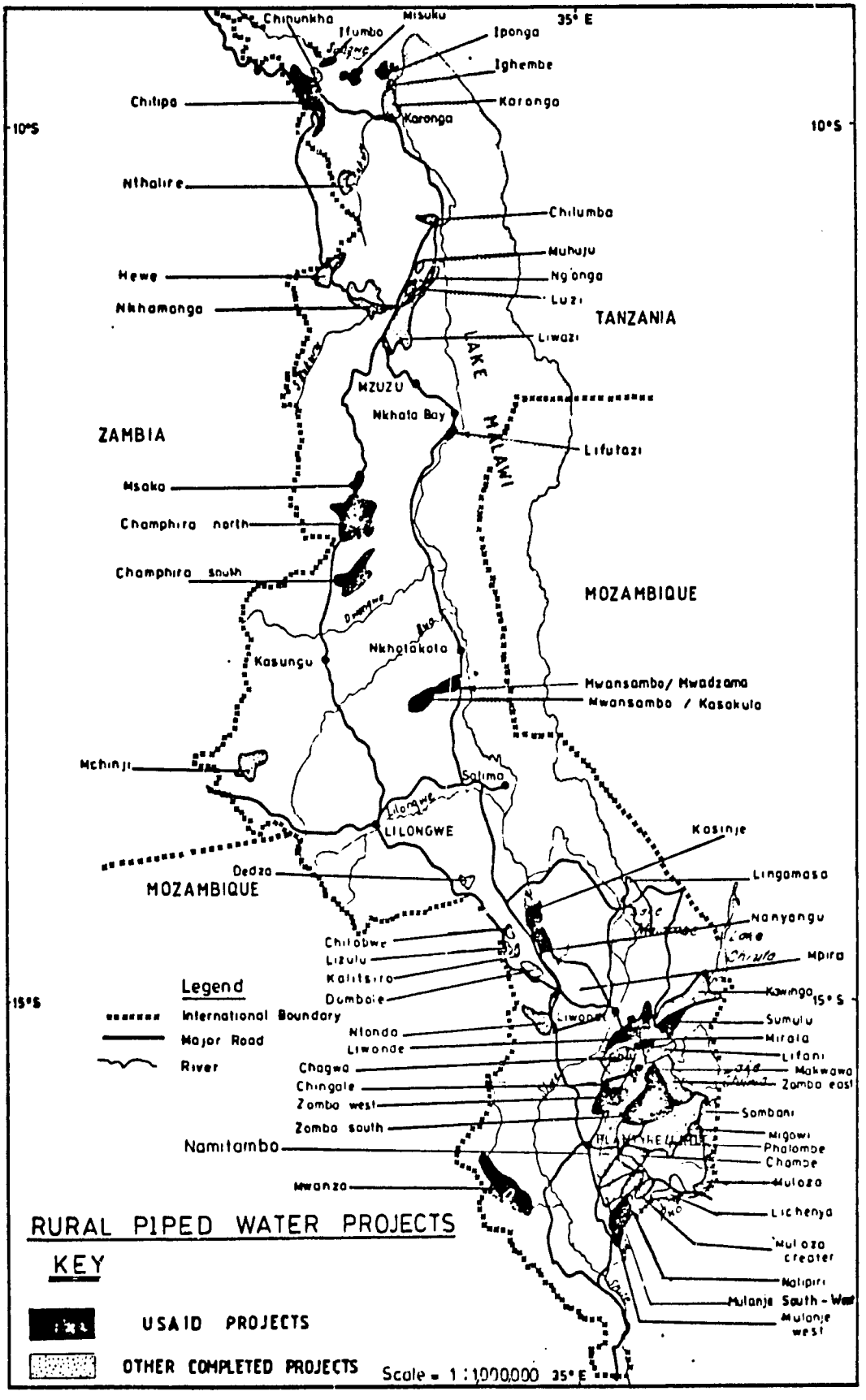
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Photo 1. Pipelines collect water from mountain streams within protected forest reserves.

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Exchange Rate (May 1986)
US$1.00 = MK 1.75

## LIST OF ACRONYMS

| | |
|---|---|
| AAG | Area Action Group |
| CSR | Centre for Social Research of the University of Malawi |
| DDC | District Development Committee |
| DHI | District Health Inspector |
| DLVW | Department of Lands, Valuation and Water |
| GOM | Government of Malawi |
| HA | Health Assistant |
| HSA | Health Surveillance Assistant |
| HESP | Health Education and Sanitation Promotion |
| Kwacha | or the abbreviation MK means the currency of the Republic of Malawi |
| lcd | liters per capita per day |
| LPO | A Malawi Local Purchase Order |
| MA | Monitoring Assistant |
| MCP | Malawi Congress Party |
| MOH | Ministry of Health |
| MOWS | Ministry of Works and Supplies |
| PHC | Principal Health Coordinator |
| PIL | A Project Implementation Letter issued by USAID |
| RWO | Rural Water Operator |
| RWS | Rural Water Section (a division of the Department of Water of the Ministry of Works and Supplies) |
| VDC | Village Development Committee |
| VHC | Village Health Committee |
| USAID | The Malawi mission of the United States Agency for International Development |

## ACKNOWLEDGEMENTS

The evaluation team wishes to acknowledge the outstanding cooperation and assistance given by many individuals during this final assessment of the Malawi Rural Piped Water Project. Initial recognition must be given to the assistance of Charles Gurney, USAID Public Health Officer, and John Hicks, USAID Mission Director. Within the GOM, many officials were instrumental in helping the team to obtain the necessary understanding and insights into the project. Chief among these were B.H. Mwakikunga, Water Engineer in Chief; N.L.B. Chaya, RWS Engineer-South Region; W.R.G. Mandowa, RWS Engineer-North Region of the Ministry of Works and Supplies; and Mr. Yohane Nyasulu, Acting Principal Health Coordinator of the Ministry of Health. These individuals, more than any others, were responsible for providing the team with access to information in the field, in the office, and at the highest levels of government. In addition, acknowledgement is given to the wholehearted assistance of other GOM, United Nations, and USAID officials during this evaluation. Particular mention must be given to the dedicated field staffs of the water and health ministries and, especially, to the people of Malawi themselves, who unselfishly serve on a variety of water, health, maintenance, and political committees for the overall betterment of their communities. Their expressions of concern for the project and their willingness to work for its continued improvement were among the most gratifying aspects of our work.

## EXECUTIVE SUMMARY

This report constitutes the final evaluation of the USAID-financed Malaŵi Self-Help Rural Water Supply Program (Project No. 612-0207). The evaluation was performed by a four-person team sent from the Water and Sanitation for Health (WASH) Project in Washington, D.C., over the period 4 to 24 May 1986. A similar WASH team carried out a mid-project evaluation in August 1983.

The Malaŵi rural piped water program and its associated Health Education and Sanitation Promotion (HESP) component are excellent examples of the overall development success that can be achieved through the proper integration of water supply, health education, and sanitation. Beginning with a well-established and sound self-help rural piped water program in 1980, USAID financing has supported a major expansion of the piped water construction program as well as the successful addition of health education, sanitation, and research inputs.

As in the mid-term evaluation, the evaluation team finds that the strengths of the project lie in the full involvement of the user communities, field staff within the Ministry of Works and Supplies (MOWS) and Ministry of Health (MOH), which are sensitive to the needs of a community-based approach to rural water and sanitation development, and dedicated senior staff within the MOWS and MOH.

The evaluation team believes there are opportunities to strengthen the project and increase its effectiveness, but these should be viewed as suggestions for further improvement and not as fundamental criticisms of what is probably the most outstanding rural piped water program in Africa.

General Findings:

1. The USAID-financed project started in August 1980, and the original completion date of July 1985 was extended to December 1988. It is expected that the majority of construction activities will end by December 1987, although monitoring and maintenance will continue throughout the life of the project.

2. Of the total USAID grant of $6,000,000, $4,600,000 was expended by 31 March 1986, thereby leaving a balance of $1,400,000 for project completion. By the end of the USAID-financed program, the Government of Malaŵi (GOM) will have expended approximately $1,062,000 on the project, and the project communities will have provided contributions equivalent to $881,000.

3. The project has 19 rural piped water schemes, of which 18 are new construction and 1 consists of a series of pipe replacements on earlier schemes. To date, 12 projects are completed, with another 6 under construction. These 18 projects have a design population of 422,000 and at present are serving approximately 265,000 people.

4. HESP activities have been promoted in approximately 900 targeted villages. Approximately 270,000 people have been reached by HESP activities in seven USAID-supported schemes and six non-USAID schemes.

5. The average construction cost of the rural piped water schemes is MK 18 per person to be ultimately served, of which 80 percent is in cash. The estimated annual maintenance cost for existing schemes is approximately MK 0.30 per person, of which 50 percent is in cash.

6. Within the MOWS, USAID funds are supporting the salaries of all Rural Water Section (RWS) field staff below the level of Supervisor. This includes 55 rural water operators (RWO) and 33 monitoring assistants (MA). None of these positions are established.

7. The MOH supports the salaries of all health staff involved in the HESP component. This includes 1 Principal Health Coordinator (PHC), 14 supervisors, 16 health assistants (HA), and 91 health surveillance assistants (HSA). All of these positions are established.

Conclusions:

Financial

1. Funding has been adequate for the MOWS activities, but could have been greater for MOH activities.

2. The success of the project could not have been achieved without the essential input of USAID, the GOM, and local communities.

3. Since the mid-term evaluation, project financial management by the MOWS and MOH has shown marked improvement.

Technical

1. The engineering designs and construction procedures used in the program are well suited to the rural conditions of project sites.

2. Further development is needed in designing low-cost latrines and water treatment technologies.

3. Completed schemes show a high degree of reliability in delivering water to rural communities.

Management

1. Both the rural piped water program in the MOWS and the HESP component in the MOH have good management control and technical direction from their senior staff.

2. Key staff in both the RWS and HESP are overloaded and need additional senior staff support.

3. Field-level staff (MAs and HSAs) are generally performing adequately but could be more effective with additional training and logistical support.

4. A need exists to integrate HESP activities more closely into project construction.

5. An urgent need exists for long-range planning beyond the completion of the USAID project.

Maintenance

1. Community-based pipe repair teams are performing well in maintaining project schemes.

2. A growing need exists to generate revenue for maintenarce purposes.

3. Community participation in maintenance committees may be made more effective in a number of ways.

Community Participation

1. Project-related local committees form the basis for full community involvement in the project.

2. The high degree of community participation is the primary element in the continuing success of the project.

Training and Manpower

1. Women are not receiving sufficient technical training in water and sanitation.

2. Both the rural piped water program in the MOWS and the HESP component in the MOH need a manpower development plan.

Monitoring and Evaluation

1. Field-level monitoring systems in the MOWS operate well.

2. Field-level monitoring systems in the MOH require more supervisory feedback.

3. Neither the MOWS nor the MOH has the current capacity to carry out necessary evaluation studies.

4. Evaluation studies are essential for the continued success of the project.

Research

1. The project has benefited greatly from various research investigations carried out by the MOWS and outside investigators.

Project Utilization

1. In water surplus areas, taps should be sited closer to the users than in water scarce areas.

2. The HESP component is bringing about an increase in the number and usage of sanitation facilities in its target areas.

3. Rural communities throughout Malawi know of and desire to participate in the rural piped water program.

Project Impacts

1. When health education and sanitation activities are undertaken in rural piped water areas, substantial direct and indirect health benefits are a result.

2. In some areas, the project results in substantial time savings for women.

3. The project is successfully integrating the rural piped water program of the MOWS and the HESP component of the MOH.

4. The project is developing leadership and organizational skills within rural populations.

5. A need exists to involve women more in project activities.

Recommendations for the USAID-Financed Project:

1. Strengthen the HESP component in the MOH by adding another senior health officer and providing more money for field activities.

2. Incorporate washing slabs into the rural piped water construction program of the MOWS.

3. Carry out a study of the remaining potential for rural piped water projects.

4. Prepare a manpower needs assessment for the rural piped water program in the MOWS and MOH.

5. The MOWS should review and discuss Dr. Msukwa's report on institution-building for maintenance of rural piped water projects.

6. Promote greater involvement of women in project activities.

7. Form a small working group to oversee details of management of remaining project funds.

Recommendations Regarding Future Water, Sanitation, and Health Education Projects:

1. USAID should consider funding a follow-on project to the current self-help rural water supply project and its HESP component.

2. HESP activities should be expanded to cover all rural piped water projects.

3. Future donors to the rural piped water program should include an applied research and evaluation component.

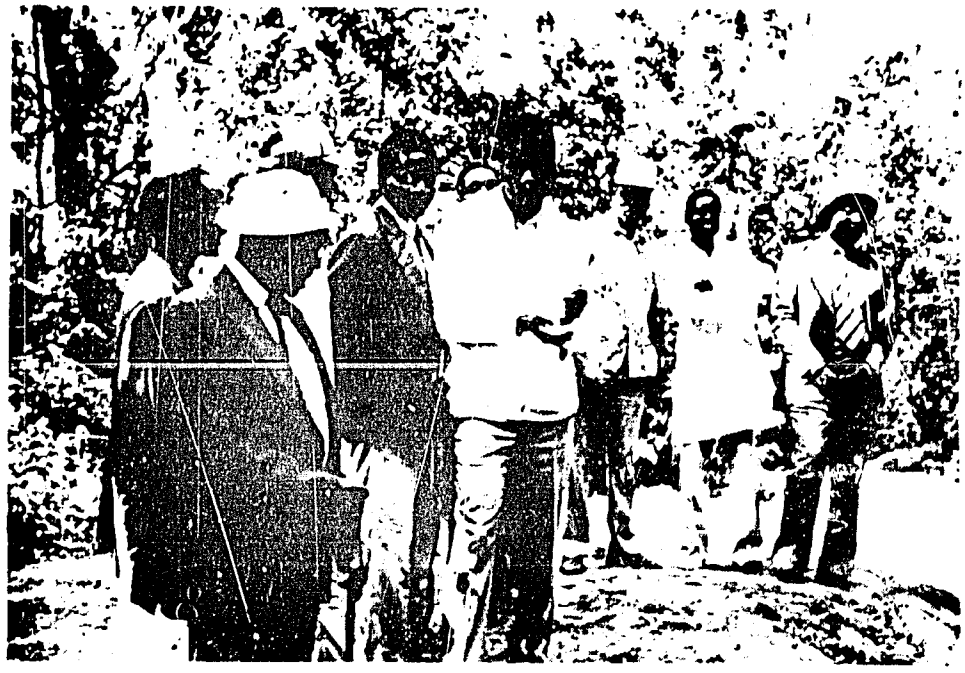

Photo 2. MOWS Field Assistant and Project Committee at pipeline intake.

Photo 3. Self-help workers, old and young.

# Chapter 1

## INTRODUCTION

This report constitutes the final evaluation of the USAID-financed rural piped water project in Malaŵi. It should be viewed as complementary to the mid-project evaluation carried out in August 1983.

The Government of Malaŵi (GOM) began developing a self-help rural water supply program in 1969. In 1980, USAID agreed to support the program with a $6 million grant over a five-year period (subsequently extended to December 1988). This money was to be used for commodity purchases, GOM field staff salaries, and the incorporation of health education and sanitation elements in the construction of up to 23 rural piped water schemes. The GOM, on its behalf, agreed to provide inputs equivalent to $2 million over the life of the project.

The main purposes of this final evaluation, as given in the original Project Paper (USAID, 1980), are to assess the health and social impacts of the project and to measure the extent to which the project provides safe water to the rural population of Malaŵi.

The Water and Sanitation for Health (WASH) Project was requested by the USAID mission in Malaŵi and the AID Office of Health in Washington, D.C., to carry out both the mid-term and final evaluations. Members of the evaluation team for the final assessment included Dennis B. Warner (team leader/sanitary engineer), John Briscoe (health analyst/economist), Craig Hafner (institutional analyst), and Bert Zellmer (financial analyst). Except for Mr. Zellmer, the same individuals participated in the mid-term assessment in 1983. Field work in Malaŵi, on which this report is based, was conducted by the team over the period 2 to 24 May 1986.

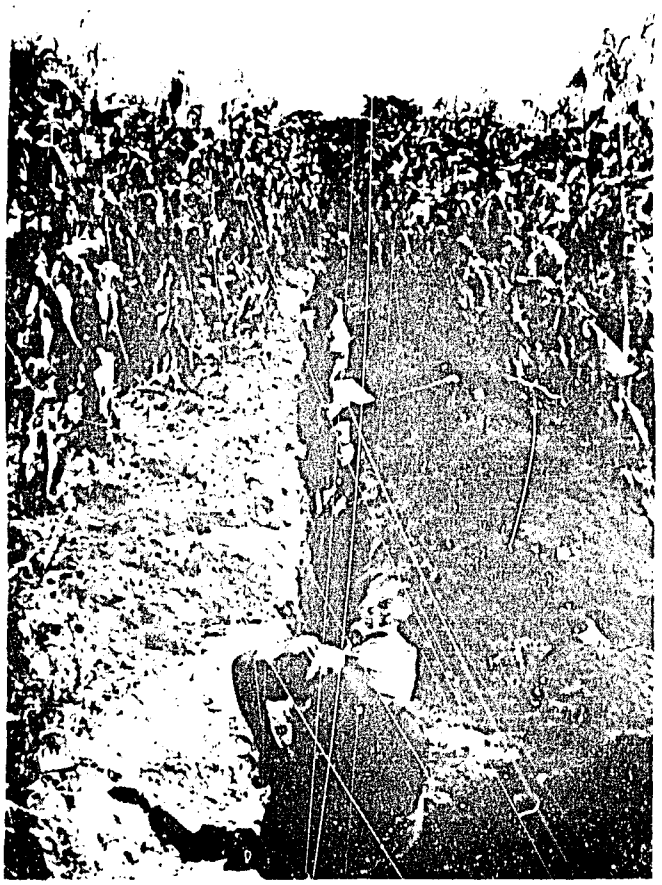

Photo 4. Trench digging by self-help labor.

Photo 5. Back filling trenches.

## Chapter 2

## BACKGROUND

### 2.1 History of the Malawi Rural Water Supply Program

Since its beginnings in 1968, the Malawi self-help rural water supply program has come to attract worldwide attention for its successes in the areas of low-cost technology, community participation, and local operations and maintenance. Over the years, numerous donors participated in the program and helped to expand its areas of operation and the numbers of people served with piped water. By 1980, the year that USAID began its current support for the program, the GOM had completed 24 projects serving 388,000 people with another seven projects, with a design population of 280,000, under construction. Self-help village labor was the basis for the construction of nearly 4,900 taps and 3,200 kilometers (km) of pipelines on these schemes.

The Malawi program is often called the most successful rural water project in all of Africa, if not the world. The accuracy of such statements is not the point here; they do, however, highlight the achievements of a program which has few equals anywhere. Within the context of water development in Africa, a continent bearing the remnants of hundreds of ill-designed, poorly maintained, or even abandoned rural water projects, it is a distinct surprise and pleasure to come upon a program that not only works but also seems to grow stronger each year.

The key factors contributing to the development of the overall Malawi program are several:

- Central government policies -- strong support for rural development and self reliance with emphasis on self-help projects.
- Perceived need for water -- rural people recognize their need for safe water and request assistance from the government.
- Favorable geographical setting -- many mountainous areas provide protected catchments for gravity piped systems to populated plains below; average annual rainfall of 45 inches.
- Strong self-help tradition -- village committees help motivate people and ensure active participation of the local people in self-help activities.
- Dedicated program staff -- technical and administrative staff are sensitive to the needs of self-help projects and skilled in community development methods.

The Malawi water program had its origins in a community development project undertaken by the Ministry of Community Development and Social Welfare (MCDSW) in the Chingale area of Zomba District in 1968. The MCDSW engineer assigned to the project, Mr. L. H. Robertson, found that the major problem facing the community was the lack of adequate water supplies, especially in the dry season when women were forced to walk several miles to collect water from a

river bed. Working with a local project committee, MCDSW staff identified permanent sources of water and drew up a plan for an intake and gravity piping to the villages. The committee agreed to self-help construction of the system, and the ministry agreed to supply the materials, which were financed with the assistance of the U.S. Ambassador's self-help fund. Within a year, and at a cost of only MK 6,000 (approximately $7,500), 25 km of PVC pipe were installed, 25 public taps were constructed, and 3,000 people were receiving a design flow of 25 lcd.

This initial scheme proved so popular that within a year another larger project was begun in the Chambe area of Mulanje District. Before making any formal plans, MCDSW staff took community leaders from Chambe to view the completed project at Chingale. These leaders then returned to their villages, discussed the potential project, and organized committees to undertake the work. MCDSW technical and material assistance was made available only after public interest was aroused and project committees had been established. This pattern of community organization preceding design and construction has remained a characteristic feature of the Malawi program to this day.

In 1971, a Water Projects Section was formed in the MCDSW to carry on further project development. Major activities over the next few years were concentrated in the Mulanje area, which included Mulanje West (75,000 population -- completed in 1975) and Phalombe (80,000 population -- completed in 1977). As MCDSW staff completed one project, some remained in the area to provide monitoring and maintenance services while others moved to new areas to work on new projects. The MCDSW began in-service training of technical staff for specific assignments to water projects in 1972. These activities gradually evolved over the following ten years into formal annual training programs and refresher courses involving all technical staff.

In 1978, two technical officers were sent overseas for university degree courses. Following their return to Malawi in 1983, they eventually assumed operational control of all field activities in the program.

Prior to the current USAID-financed project, a variety of donors helped finance development of new schemes, including OXFAM, USAID, Christian Service Committee of the Churches of Malawi, UNICEF, DANIDA, ICCO, CEBAMO, and CIDA. Overall materials costs for the 31 projects completed or under construction by 1980 totaled more than MK 3.6 million.

A 1978 WHO/World Bank report on the water sector led to the reorganization of sector institutions in the GOM the following year. In late 1979, the Water Projects Section of the MCDSW was transferred, along with the water-related functions of 13 other departments in five ministries, to the newly-created Department of Lands, Valuation and Water (DLVW) within the Office of the President and Cabinet. This move brought the rural piped program in closer contact with GOM groundwater development activities and the urban water supply programs and placed it for the first time under the control of an engineering-oriented department. In 1980, USAID and the GOM agreed to undertake a five-year expansion of the rural piped water program. USAID provided a $6 million grant for materials and the GOM, through the DLVW, agreed to provide inputs, including community self-help labor, equivalent to $2 million. The USAID-DLVW agreement expanded the program to include basic sanitation and hygiene education. As part of the new project, a mid-term evaluation was conducted by USAID

in August 1983. The following year (1984) the water related activities of the DLVW were transferred to a new Department of Water in the Ministry of Works and Supplies.

## 2.2 Objectives of the USAID-Financed Project

The program goal for the USAID/Malaŵi Self-help Rural Water Supply Project, as stated in the Project Paper (USAID, 1980), is to "improve the basic living conditions and health of Malaŵi's rural populations/poor" by reducing the water-related diseases among rural villagers and increasing disposable time for rural women and children. The project purpose is "to assist the GOM in its Rural Piped Water Program which in turn will provide safe water to a significant percentage of Malaŵi's rural population."

The specific end of project status included in the Project Paper was:

1. Up to 202,000 rural villagers (approximately 40,000 rural families) will have access to safe water from communal taps.

2. The rural water supply program -- based on the provision of gravity-fed piped water -- will be expanded, strengthened, and coordinated with the MOH.

3. Up to 202,000 rural villagers will be exposed to health education relating to improved sanitation and hygiene practices.

The major outputs as spelled out in the Project Paper were:

1. The completion of up to 23 rural piped water subprojects/systems.

2. The training of approximately 20 new Malaŵian staff annually, and the in-service training, leading to promotion, of approximately 120 Malaŵian technical staff in construction, operation, maintenance, and basic health and sanitation education.

3. Focused health education activities in sanitation and hygiene undertaken in each of the 23 locations receiving rural piped water.

4. The establishment of a fully staffed and functioning Training and Research Unit in the DLVW Rural Water Section which will institutionalize monitoring, evaluation, and research through the collection and analysis of data concerning the technical, health, economic, and social implications of safe water.

As a result of the mid-term project evaluation of August 1983, USAID dropped the requirement to establish a separate Training and Research Unit, but retained the objective of institutionalizing training, monitoring, research, and evaluation in the DLVW.

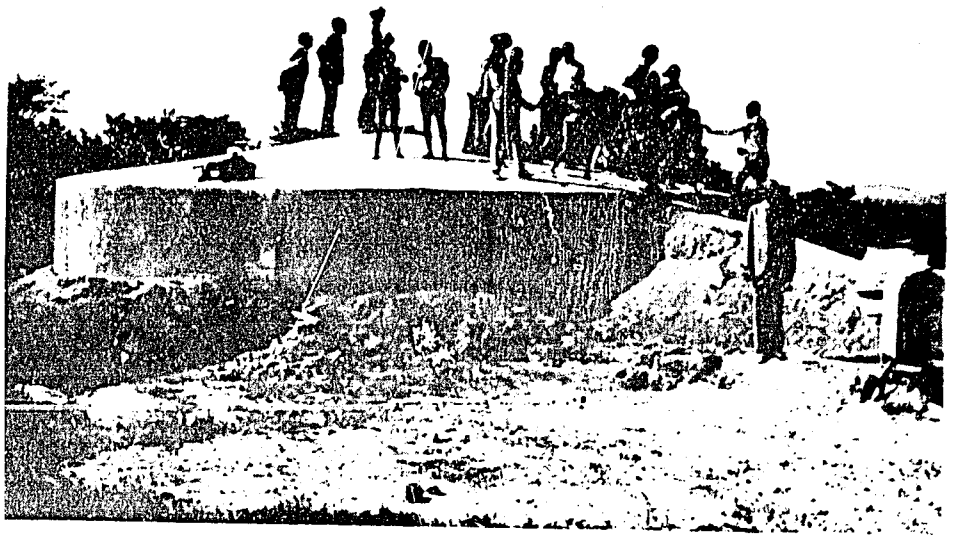

Photo 6. 30,000 gallon storage tank, Champhira South.

Photo 7. Main Project Committee, Champira South.

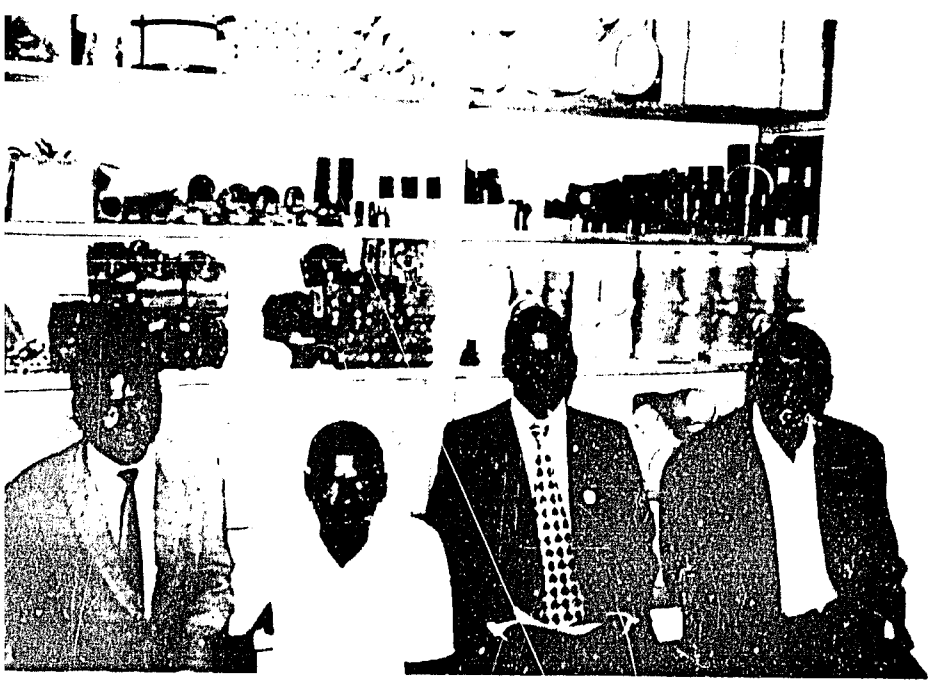

Photo 8. NIWS staff and Project Committee Members in spare parts storeroom.

## Chapter 3

## EVALUATION METHODOLOGY

### 3.1 Purpose of the Evaluation

Evaluation implies measurement, and the purpose of project evaluation is the measurement of project status to determine progress toward defined project objectives. In the Malaŵi Self-help Rural Water Supply Project, the Project Paper established a variety of objectives, termed project outputs, purposes, goals, and end-of-project status (USAID, 1980). It also called for a final evaluation of the project as well as a formative mid-term assessment of project progress.

According to the Project Paper, the purpose of the mid-term evaluation was "to validate the GOM and USAID inputs to the project as being sufficient in quality and quantity to achieve the project outputs." If deficiencies were found, the evaluation team was expected to recommend remedial actions to be undertaken during the remaining life of the project. The mid-term evaluation was conducted in August 1983, and the results were published in WASH Field Report No. 105 (Warner et al. 1983).

The Project Paper called for two important components in the final evaluation. The first was to be "a summary analysis and evaluation of the extent to which the project has had measurable health and social impacts on the project beneficiaries," while the second was "to measure the extent to which the project outputs have been achieved leading to conditions to indicate accomplishments of the project purpose." It was anticipated in the Project Paper that the final evaluation would consider either a possible extension of the project or a follow-on project.

For both the mid-term and final evaluations, USAID put special emphasis on the progress of institutional development. In the mid-term evaluation, USAID was particularly concerned with water systems management capacity, rural water information systems, technological innovations, and interministerial coordination. For the final evaluation, USAID wanted additional attention given to developing local institutions, especially the status, coordination, and sustainability of village committees and their applicability to the delivery of other rural services.

### 3.2 Evaluation Model

An evaluation model proposed in earlier WASH reports (Warner and Woolf, 1981, and Warner, 1981) was adapted for the Malaŵi Self-help Rural Water Supply Project. Emphasizing the sequential nature of linkages from initial project input to ultimate project outputs and impacts, the model, shown below in Figure 1, provides a basic framework for organizing evaluation activities.

Each level of Figure 1 represents an order of effects that are dependent upon all previous effects. The initial efficiency level consists of the immediate or direct consequences of project development, which include all project inputs, operations, and physical outputs under the control of project

officials. These consequences can generally be assessed in straightforward physical units.

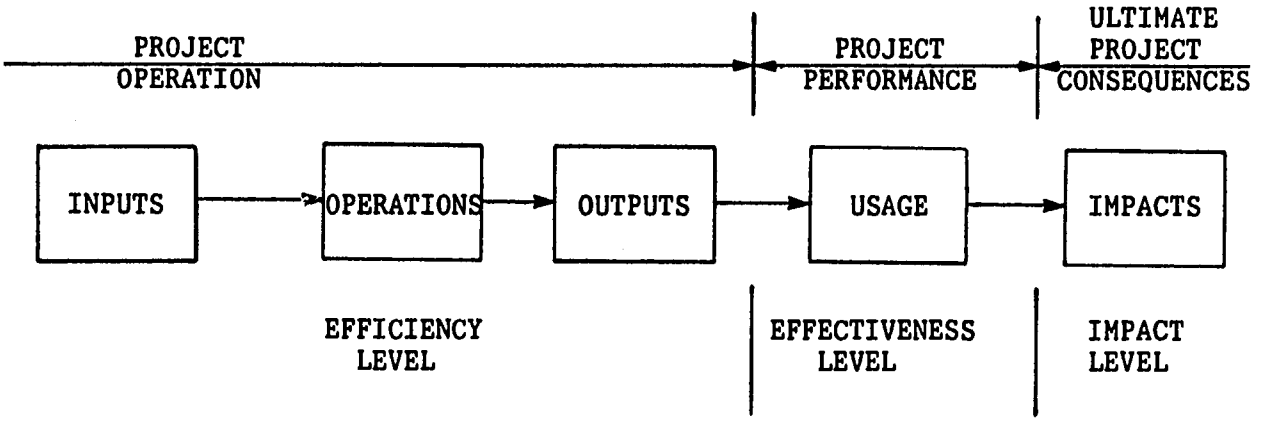


Figure 1. General Evaluation Model for Water and Sanitation Projects.

The secondary effectiveness level involves the more complex consequences of project performance, or the use of project systems. This includes the water use and sanitation practices adopted by the project communities as well as the types of health education and maintenance support the communities give to the new systems. Project officials cannot directly control these consequences. They can only hope to favorably influence the behavioral patterns in the recipient communities. Similarly, because of the difficulties in measuring behavior, surrogate, or indicator measures, often must be employed.

The third and final level is the impact level, which includes the ultimate health, economic, and social consequences of the project. To the policy maker, these are the long-run benefits that water and sanitation projects are intended to achieve. The existence of these impacts is dependent upon the occurrence of project outcomes at the earlier efficiency and effectiveness levels. Measurement of project impacts, however, is extraordinarily difficult and may require a disciplined research approach with strict project controls to produce meaningful results. The World Health Organization, in its Minimum Evaluation Procedure (WHO, 1983) advises against attempting to measure project impacts in operational field assessments.

The general evaluation model in Figure 1 formed the basis for both the mid-term and final evaluations. All evaluation issues were incorporated into the model within the following five areas:

1. Project input by USAID, GOM, and the local community.
2. Strengthening of institutions involved in the project.
3. Project outputs of community water supply and sanitation schemes.
4. Project utilization of water and sanitation systems.
5. Project impacts (health, economic, and social).

Figure 2 is an expanded view of the evaluation model adapted for the Malawi Rural Piped Water Project. In the first evaluation, emphasis was placed on measuring project progress and establishing a baseline of data for the final

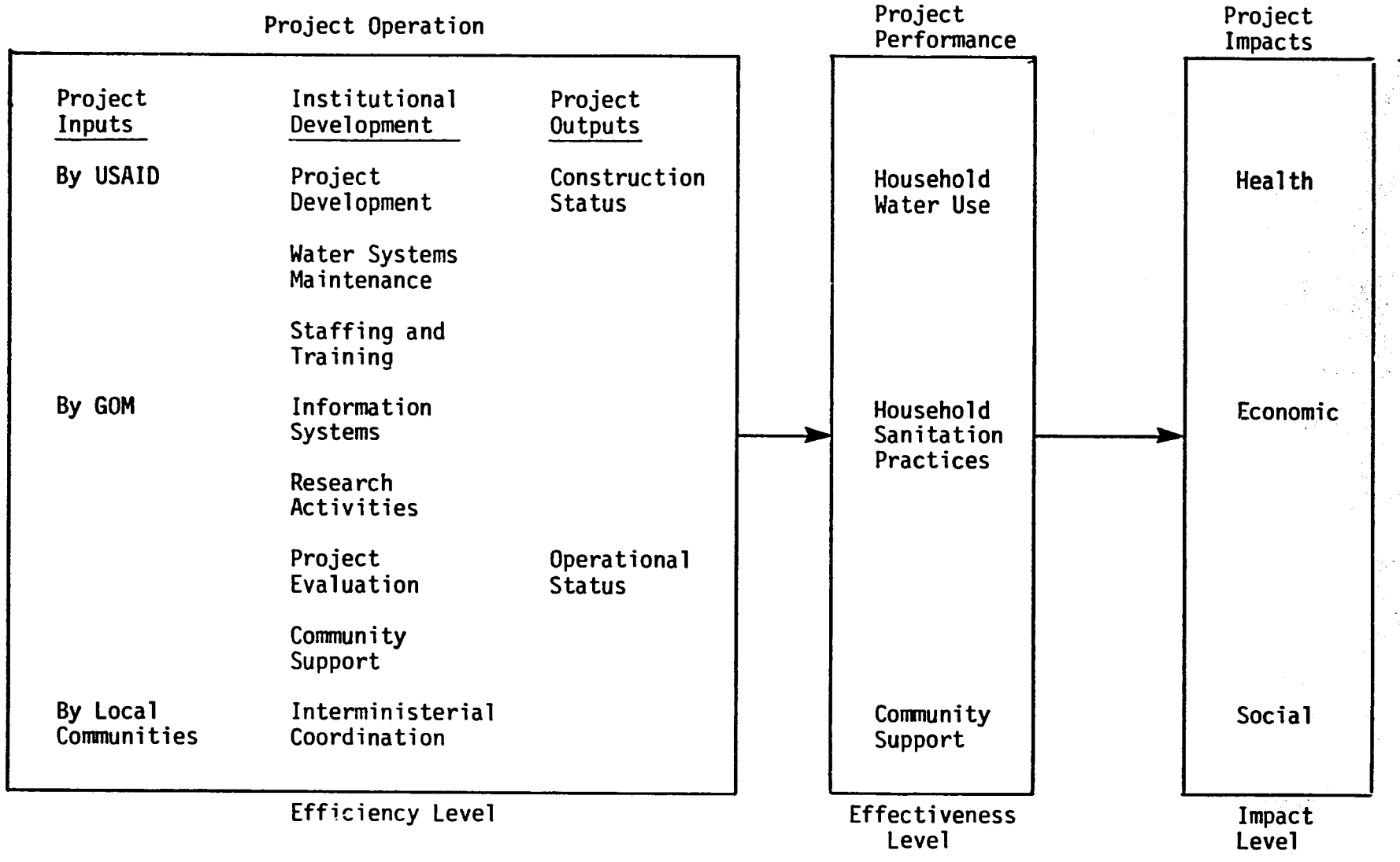


Figure 2. Evaluation Model for Malaŵi Rural Piped Water Project.

evaluation. This led to a primary concentration on project status through the development of a detailed baseline of data on the initial project operations or efficiency level of the evaluation model. Secondary efforts in the mid-term review were given to the assessment of the higher level outcomes of project performance and ultimate project impacts.

For the final evaluation, however, relatively less emphasis was given to the collection of data and the description of systems, and more attention was focused on the actual performance of project institutions and the measurable health, economic and social impacts arising from them. This shift of emphasis is believed to be appropriate to meet the main objectives of the final evaluation:

1. To assess the progress of the project
2. To advise USAID regarding the completion of the current project
3. To advise USAID on future water, sanitation and health projects.

The detailed scope of work for this evaluation is included as Appendix B.

## 3.3 Evaluation Procedures

The procedures used in this final evaluation can be described in terms of evaluation design, organization, data collection, analysis, and reporting.

Evaluation design for the Malawi Self-help Rural Water Supply Project was based upon the model developed by the WASH Project for the mid-term assessment conducted in August 1983. As described in Section 3.2, the model set out a sequential order of effects consisting of project inputs and direct outputs, project-related behavioral characteristics, and ultimate project impacts. The corresponding scope of work for this evaluation, which was approved by USAID in April 1986, was based upon the scope of work and evaluation design used in the mid-term assessment. The scope of work was discussed with representatives of the AID Office of Health and the Africa Bureau in planning sessions prior to the field visit in May 1986. The evaluation team approached the assignment from the standpoint of providing USAID with an operational end-of-project assessment of a continuing program which had not yet expended all project funds. The evaluation was not intended to be a research study with rigorous experimental controls and statistical procedures but rather an assessment which measured the overall performance of the project and provided guidance to USAID regarding similar projects in the future.

Organization of the evaluation began with the assembly of the team in April 1986. A team planning session was held in the WASH office on 1 May to review the project, the new scope of work, identify major issues, clients, and outcomes, and to assign responsibility for subelements of the scope of work to specific individuals. While in Malawi, the team met several times a week to discuss findings and to prepare conclusions and recommendations.

Data collection included the mid-term evaluation report and other documents available in Washington, D.C., and in Malawi; meetings and interviews with officials of USAID, MOH, and MOWS; and visits to project sites. The team visited subproject areas at Champhira South, Champhira North, Zomba West, Liwonde, Mwanza, and Mulanje area augmentation sites, as well as non-USAID

schemes at Domboli, Sombani, and Muloza Crater. In addition, the team also visited the Livulezi Integrated Rural Groundwater Project to observe the implementation and maintenance procedures of an MOWS rural water project based on boreholes.

Data analysis began shortly after arrival of the team in Malawi. Key issues were discussed within the team and reviewed with USAID and GOM officials before either any conclusions or recommendations were completed. The evaluation team attempted to keep both USAID and the GOM informed of all critical evaluation findings and give them the opportunity to discuss the main recommendations before its formal presentation at the final briefings or in the draft report.

Reporting included a series of informal meetings with USAID and GOM officials during the course of the field work. A formal debriefing to review the draft conclusions and recommendations with USAID, MOWS, MOH, and several UNDP officials was held on 22 May. In addition, a second debriefing was held with the permanent secretary to the MOWS on 23 May. This meeting included the USAID mission director and senior officials of the MOWS and MOH.

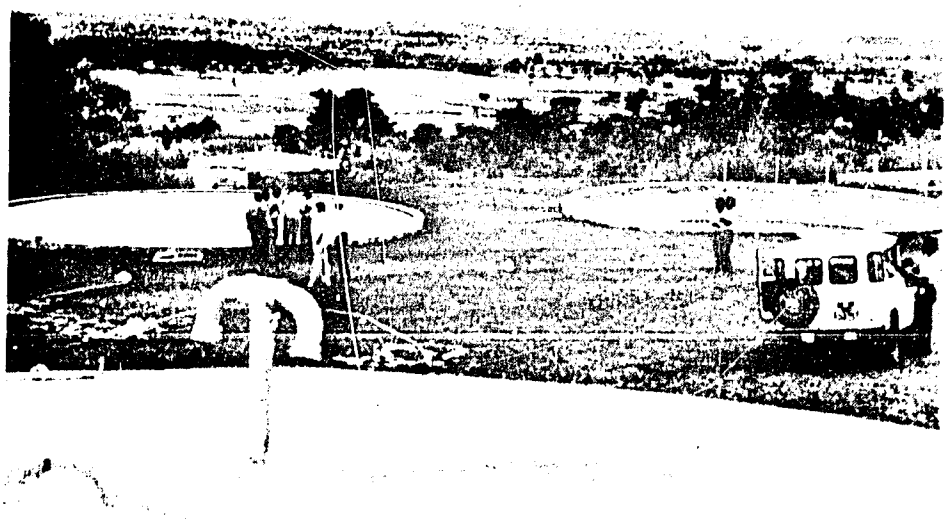

Photo 9 (left). Slow sand filters at Dombole rural water supply project (funded by CIDA).

Photo 10. Member of Pipe Repair Team carrying out repairs.

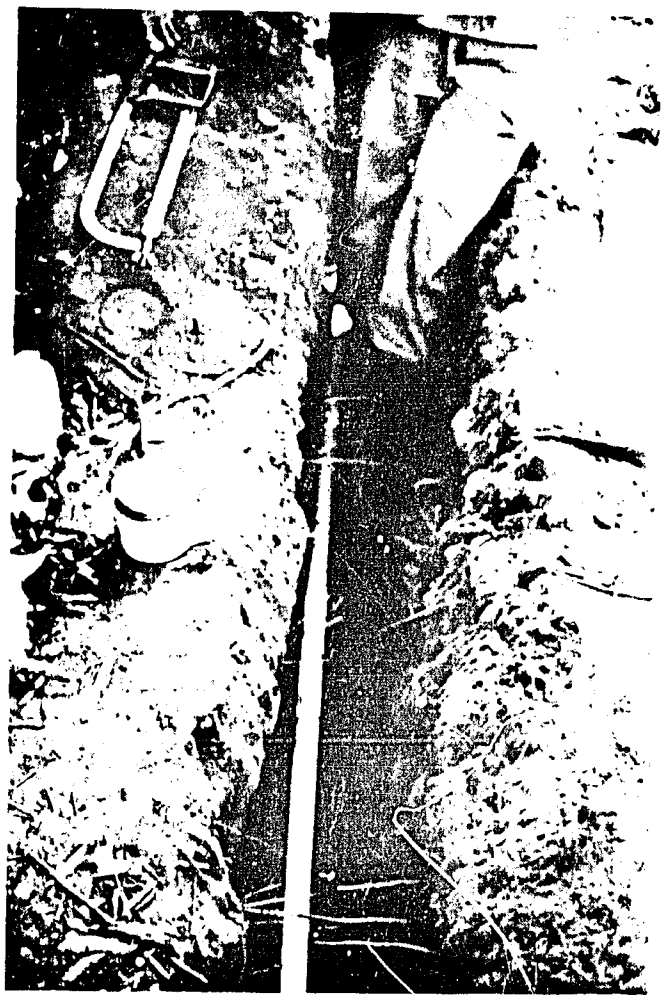

Photo 11. Relaying pipe following repair.

# Chapter 4

## PROJECT OPERATION: INPUT

Inputs to this project have been provided by USAID, the Government, and people of Malawi and, to a limited extent, by other donor nations and agencies. At the time of this evaluation (May 1986), some project inputs had not yet been applied.

### 4.1 USAID Input

The Project Paper identified three components of the Malawi Self-help Rural Water Supply Project having a total grant amount of $6 million, as detailed in Table 1. These are construction activities, maintenance activities, and relevant monitoring and evaluation activities. USAID followed the procedures outlined in the Project Paper and subsequent project implementation letters in disbursing funds. Major purchases of pipes, equipment, vehicles, and expatriate services are processed directly by USAID. The Ministry of Works and Supplies (MOWS) and the Ministry of Health (MOH) purchase services and commodities and submit claims for reimbursement. These claims are routed through and reviewed by Treasury, which serves as the prime GOM executing agency.

#### 4.1.1 Construction Program

USAID earmarked $5,036,000 for the construction of intakes, pipelines, tanks and tap sites in the Project Paper. Through 31 March 1986 a total of $4,017,129 had been expended on construction activities, as shown in Table 1. Table 2 shows the current status of the subproject construction programs, while Table 3 details the approved and expended costs for the subprojects. Information on service area population and subproject costs are presented in Table 4. This reveals direct capital (cash input) costs of MK 17.3 per capita using 1986 population estimates. When design population is used, the figure drops to MK 13.1. The 1986 population is a projection based on the 1977 census and national growth rates. The design population is often based on the "ultimate population" of the service area. This "ultimate population" is derived from the agricultural potential of the project area and its projected 20-year increase in population. Costs generally represent only USAID-funded costs. Excluded are salaries and overheads paid by the GOM, self-help labor inputs, land costs, and contributions by other donors (which have included senior project staff salaries).

Table 1

USAID Input

(As of 31 March 1986)

| | Earmarked | Committed | Expended, Accrued, or Identified by Evaluation | Committed Balance | Earmarked Balance |
|---|---|---|---|---|---|
| Construction | $5,036,000 (84%) | $4,880,859 (80%) | $4,017,129 (67%) | $863,730 (14.5%) | $1,018,871 (17%) |
| Maintenance | 333,000 (6%) | 260,049 (4.5%) | 288,397 (5%) | (28,348)(-.5%) | 44,603 (1%) |
| Monitoring, Coordination, Evaluation | 305,000 (5%) | 324,123 (55%) | 367,684 (7%) | (43,561)(-1%) | (62,684)(-1%) |
| Sub-total | $5,674,000 (95%) | $5,465,031 (90%) | $4,673,210 (78%) | $791,821 (13%) | $1,000,790 (17%) |
| Unallocated Contingencies | 326,000 (5%) | | | | 326,000 (5%) |
| Total | $6,000,000 (100%) | | | | $1,326,790 (22%) |

Note: HESP activity retains $25,779 earmarked and undisbursed. This amount includes an allowance for a pending reimbursement claim for the period July 1985 through March 1986.

Table 2

**Physical and Financial Progress of Subprojects**

(As of 31 March 1986)

| Name | Proportion Completed (%) | | | Expenditure (MK 1000) | | | | | USAID-Approved Budget (MK 1000) | Budget Expended (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Intake | Pipeline | Taps | Pipes and Fittings | Plant and Vehicles | Field Staff | Running Costs/ Misc | Total | | |
| *Liwonde | 100 | 100 | 100 | 71 | 0 | 4 | 13 | 88 | 221 | * |
| *Kasanje/Nanyangu | 100 | 100 | 100 | 43 | 0 | 12 | 28 | 83 | 259 | * |
| *Iponga | 100 | 100 | 100 | 7 | 0 | 1 | 4 | 12 | 67 | * |
| o+Chitipa & Ext. | 100 | 85 | 80 | 155 | 0 | 40 | 122 | 317 | 301 | 105+% |
| o+Mwanza | 100 | 80 | 40 | 834 | 6 | 19 | 127 | 986 | 1,079 | 91+ |
| Chimaliro | 100 | 100 | 100 | 201 | 0 | 6 | 36 | 243 | 236 | 103 |
| Zumulu | 100 | 100 | 100 | 207 | 0 | 13 | 46 | 266 | 261 | 102 |
| Mwansambo/Kasakula | 100 | 100 | 100 | 105 | 0 | 7 | 45 | 157 | 157 | 100 |
| Misuku | 100 | 100 | 100 | 28 | 0 | 2 | 15 | 45 | 41 | 110 |
| Mirala | 100 | 100 | 100 | 83 | 0 | 9 | 20 | 112 | 108 | 104 |
| Makwawa | 100 | 100 | 100 | 70 | 0 | 8 | 15 | 93 | 93 | 100 |
| +Chimaliro S. | 100 | 75 | 20 | 429 | 0 | 17 | 67 | 513 | 512 | 100+ |
| +Zomba West | 100 | 95 | 80 | 555 | 0 | 39 | 106 | 700 | 691 | 101+ |
| +Msaka | 0 | 50 | 0 | 28 | 0 | 0 | 11 | 39 | 58 | 67+ |
| +Mwansambo/Mwadzama | 100 | 70 | 10 | 113 | 0 | 2 | 16 | 131 | 150 | 87+ |
| +Augmentation | ---- N/A ---- | | | 245 | 0 | 23 | 84 | 352 | 380 | 93+ |
| +Lifutazi | 100 | 50 | 25 | 8 | 0 | 1 | 10 | 19 | 57 | 33+ |
| xMulanje Southwest | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 596 | x |
| *Unallocated | ---- N/A ---- | | | 166 | 55 | 20 | 124 | 36 | 0 | * |
| Totals | | | | 3,348 | 61 | 223 | 889 | 4,521 | 5,267 | 86 |

Legend:

* 1981 expenditures were not allocated to sub-projects.

\+ Construction still in progress.

x Construction not yet in progress.

o Construction delayed due to flood damage.

N/A Not applicable

Table 3

**Details of USAID-Funded Subprojects**

(Thousands of Kwacha)

| Name | USAID-Approved Cost | GOM Expenditures (as of 31 March 1986) and USAID Pipe Purchases | Balance |
|---|---|---|---|
| Liwonde | MK 221 | MK 88* | MK 133* |
| Kasinje/Nanyangu | 259 | 83* | 176* |
| Iponga | 67 | 12* | 55* |
| Chitipa & extensions | 301 | 317 | (16) |
| Mwanza | 1,079 | 986 | 93 |
| Chimaliro (Champhira N) | 236 | 243 | (7) |
| Zumulu | 261 | 266 | (5) |
| Mwansambo/Kasakobi | 157 | 157 | -0- |
| Misoko | 41 | 45 | (4) |
| Mirala | 108 | 112 | (4) |
| Makwakwa | 93 | 93 | -0- |
| Chimaliro S(Champhira S) | 512 | 513 | (1) |
| Zomba West | 691 | 700 | (9) |
| Msaka | 58 | 39 | 19 |
| Mwansambo/Mwadzama | 150 | 131 | 19 |
| Augmentation | 380 | 352 | 28 |
| Lifutazi | 57 | 19 | 38 |
| Mulanje Southwest | 596 | -0- | 596 |
| Unallocated | ____ | 365* | (365)* |
| Total | MK 5,267 | MK 4,521 | MK 746 |

*Unallocated expenditures were shared by Liwonde, Kasinje/Nanyangu, Iponga, and Chitipa.

A comparison of projected, planned, and actual costs incurred in construction to date is presented in Table 5. Actual costs were closer to projections at the time of initial project approval than with individual subproject submissions at the mid-term evaluation. Increased fuel and commodity costs account for the majority of the variations.

Table 4

Per Capita Direct Costs of Subprojects

| Name | Estimated Population 1986 | Design Population | Cash Inputs (MK 1,000) | Pipe (km) | Taps | Current Cost per Capita (MK) | Design Cost Per Capita (MK) |
|---|---|---|---|---|---|---|---|
| Liwonde | 19,335 | 23,000 | 222 | 110 | 130 | 11.5 | 9.7 |
| Kasanje/Nanjangu | 39,098 | 54,000 | 259 | 85 | 226 | 6.6 | 5.0 |
| Iponga | 5,871 | 5,600 | 67 | 24 | 35 | 11.4 | 12.0 |
| Chitipa & Extensions | 17,377 | 46,000 | 917+* | 323 | 300 | 52.8 | 19.9 |
| Mwanza | 34,805 | 40,000 | 1,079* | 218 | 400 | 31.0 o | 27.0 o |
| Chimaliro (Champhira N) | 17,425 | 24,000 | 243 | 167 | 154 | 13.9 | 10.1 |
| Zumulu | 21,877 | 23,500 | 266 | 80 | 100 | 12.2 | 11.3 |
| Mwansambo/Kasakula | 18,061 | 25,000 | 157 | 60 | 145 | 8.7 | 6.3 |
| Misuku | 3,610 | 3,700 | 45 | 17 | 70 | 12.5 | 12.2 |
| Mirala | 11,733 | 13,000 | 112 | 56 | 81 | 9.5 | 8.6 |
| Makwawa | 18,944 | 16,000 | 93 | 68 | 101 | 4.9 | 5.8 |
| Chimaliro S (Champhira S) | 22,012 | 32,000 | 513* | 221 | 200 | 23.3 | 16.0 |
| Zomba West | 45,667 | 60,000 | 700* | 340 | 353 | 15.3 | 11.7 |
| Msaka | 1,913 | 3,000 | 58* | 37 | 35 | 30.3 | 19.3 |
| Mwansambo/Mwadzama | 10,642 | 18,000 | 150* | 50 | 100 | 14.1 | 8.3 |
| Augmentation | N/A | N/A | N/A | 47 | N/A | N/A | N/A |
| Lifutazi | 9,371 | 11,000 | 57* | 40 | 43 | 6.1 | 5.2 |
| Mulanje Southwest | 21,907 | 24,000 | 596 | 117 | 200 | 27.2 | 24.8 |
| Total | 319,648 | 421,800 | 5,534 | 2,060 | 2,673 | 17.3 | 13.1 |

* Indicates that the higher of budget/current cost used for projects still under construction.

\+ Includes non-USAID pipe input.

o Subproject costs include water treatment.

N/A Not applicable

Table 5

**Comparison of Magnitude of Construction Cost Components**

| | Project Paper | Project Submission Through Mid-term Evaluation | Costs Incurred Through 31 March 1986 |
|---|---|---|---|
| Commodities | 66% | 87% | 74% |
| Vehicles and Equipment | 8% | 4% | 1% |
| Field Staff | 10% | 4% | 5% |
| Operating Costs and Miscellaneous | 16% | 7% | 20% |

The construction schedules of the subprojects at the mid-term and final evaluations are presented in Figures 3 and 4. A comparison reveals subproject completion delays in Chitipa, Mwanza, Chimaliro South, and Zomba West. These delays and the deletion of the Zomba South subproject have resulted in a balance of more than $1,000,000 in project funds earmarked for construction activities. This is detailed in Table 1.

Conclusions which can be drawn from the material presented on USAID construction input are:

1. USAID input into the construction of completed subprojects equal or slightly exceed approved totals.

2. Construction expenditures for commodities and for operating and miscellaneous costs were higher than anticipated in the Project Paper. Vehicles, equipment and field staff inputs were significantly less than anticipated.

3. Two subprojects, Augmentation and Mulanje Southwest, have the potential to be delayed beyond the authorized completion date of the project: 31 December 1988.

4. Close attention to project management will be necessary in order to utilize all construction funds and to bring all subprojects to completion by December 1988.

5. Substantial substitution of subprojects occurred as MOWS staff developed construction plans.

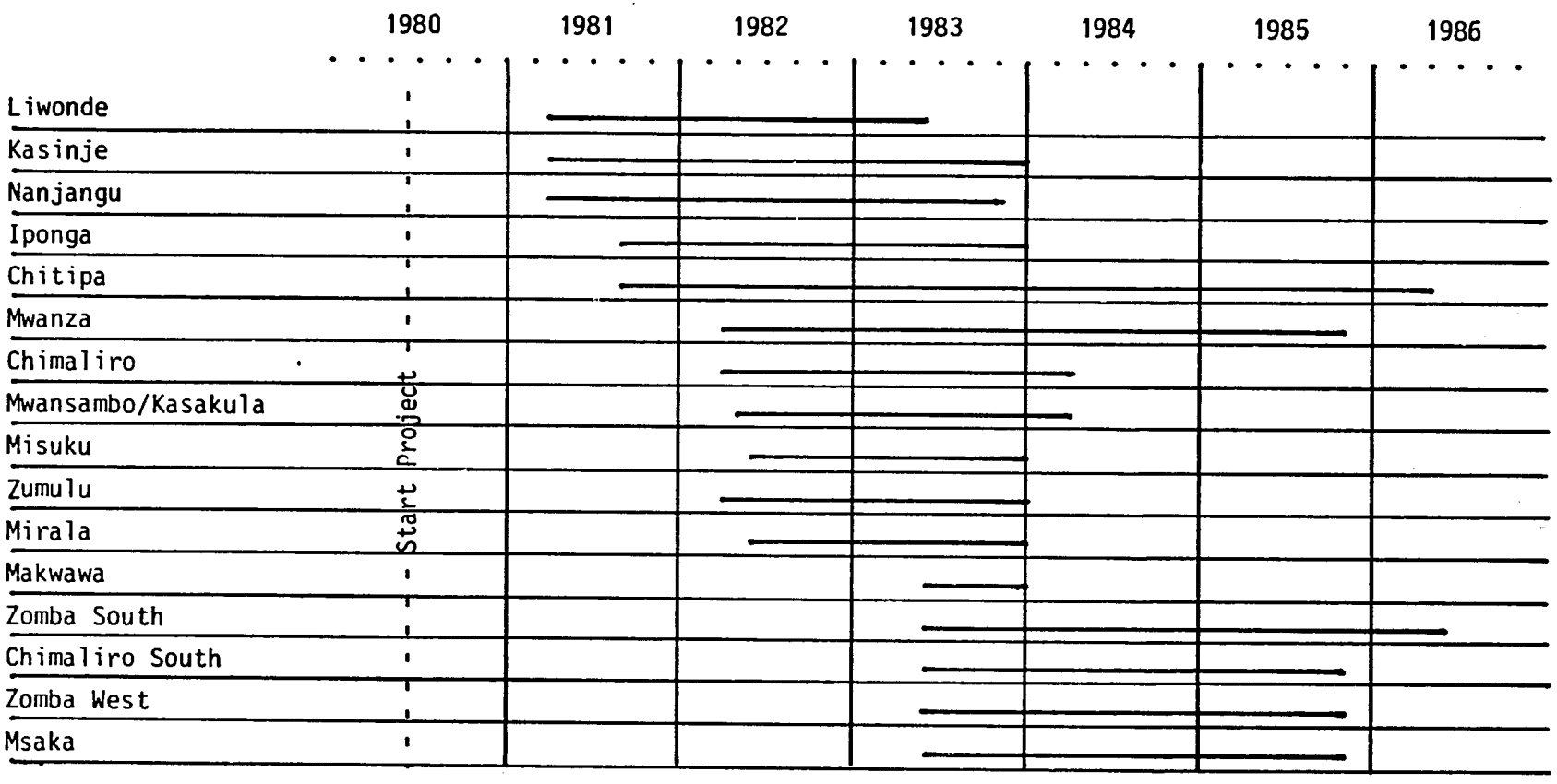


Figure 3. Malawi Rural Piped Water Project Construction Program at time of Mid-Term Evaluation - September 1983

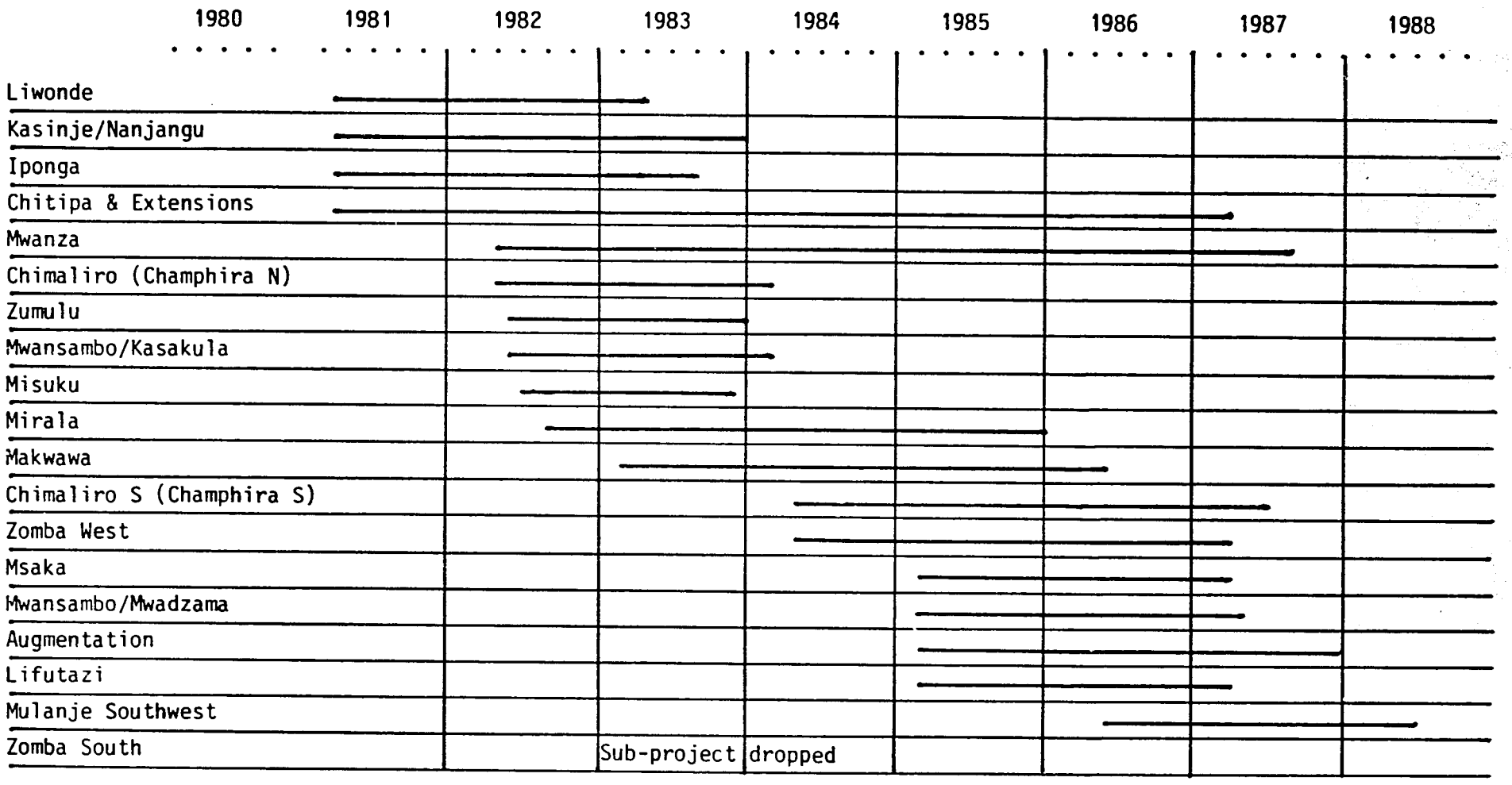


Figure 4. Malawi Rural Piped Water Project Construction Program at time of Project Evaluation - May 1986

### 4.1.2 Maintenance Program

The goal of the maintenance program is to develop the necessary institutional capacity and human resources to ensure that completed subprojects continue to provide safe and reliable water supply. To these ends, $333,000 was earmarked for the maintenance component, to be accomplished with inputs of salaries, equipment, training expenses, transport, reference works and publications, and operating costs.

Table 6 indicates that 14 percent of the inputs, or $45,000, remains to be expended. Currently, the GOM is using maintenance funds at the rate of $50,000 annually, which is the rate projected in the Project Paper. Funds for this component have been extended beyond the original contract completion date because actual expenditures for office equipment and water rates were significantly less than those projected in the early years of the project. No evidence was found that this has endangered project success.

Project staff have indicated a desire to obtain further training, reference materials, and publications. Subject to USAID review of training plans, these inputs are justified and likely to contribute to program goals.

### 4.1.3 Monitoring, Coordination, and Evaluation Program

This project component, funded at $305,000, has two objectives -- to stimulate the provision of health (hygiene) education and sanitation activities in rural areas of Malawi served by piped water systems and to generate data and analysis for project monitoring, evaluation, and adaptation. The specific inputs intended to achieve these dual objectives have been of necessity, modified from those given in the Project Paper by the shortened term of service of the funded Primary Health Coordinator (PHC) and the deletion of the senior evaluation specialist position. Other contracted data-gathering and analysis activities have been obtained, the results of which have provided substantial input into the current evaluation paper. The funding of the PHC has been transferred to the GOM since August 1984. HESP support has continued to provide funds for vehicles, operating expenses, training, and limited commodity purchases. These inputs are crucial to the achievement of health status impacts as described in the Project Paper. Supplemental funds for HESP activities have been approved periodically by Project Implementation Letters (PIL). As of 31 March 1986, slightly more than $25,000 of obligated funds remained for the HESP component, as shown in Table 7.

The mid-term evaluation noted that the provision of $99,000 of equipment for the water quality laboratory of the MOWS was a major new item introduced into the project. The mid-term evaluation also predicted that then-current policies would cause total expenditures on evaluation to be "well below the levels budgeted in the Project Paper." This has not proved to be the case as over $88,000 more than the original budget has been earmarked for non-HESP evaluation activities over the life of the project.

Table 6

**USAID Inputs to Maintenance Program**
**(As of 31 March 1986)**

(Thousands of Dollars or Kwacha)

| Input | Earmarked ($) | Committed ($) | USAID Expended ($) | MOWS Expended (MK) | Committed Balance ($) | Earmarked Balance ($) |
|---|---|---|---|---|---|---|
| Commodities | 38 | | | 36 | | |
| Equipment and Vehicles | 28 | | 109 | 0 | | |
| Salaries | 100 | | | 89 | | |
| Operating Costs | 61 | | | 75 | | |
| Tools, Housing, Miscellaneous | 106 | | | 106 | | |
| Reimburse GOM | ___ | 260 | 179 | ___ | ___ | ___ |
| Total | 333 | 260 | 288 | 306 | (28) | 45 |
| | (100%) | (78%) | (86%) | | | (14%) |

Table 7

**USAID Inputs for Monitoring, Coordination, and Evaluation**

(As of 31 March 1986)

| Input | Earmarked | Committed | Disbursed (Includes Claim Pending) | Committed Balance | Earmarked Balance |
|---|---|---|---|---|---|
| HESP: | | | | | |
| PHC | $ 63,863 | $ 63,863 | $ 62,076 | $ 1,787 | $ 1,787 |
| Support | 196,600 | 152,410 | 172,608 | (20,198) | 23,992 |
| Subtotal | $260,463 | $216,273 | $234,684 | ($18,411) | $25,779 |
| Data Collection (Analysis) | $44,537 | $107,850 | $133,000 | ($25,150) | ($88,463) |
| Total | $305,000 | $324,123 | $367,684 | ($43,561) | ($62,684) |
| | (100%) | (106%) | (121%) | (-14%) | (-21%) |

4.1.4 Payments by USAID

Payments from USAID to support project activities are of two types, direct payment and reimbursement through the Treasury for project expenditures. At the time of the mid-term evaluation, significant delays were occurring in the second flow (reimbursement). An independent financial and accounting review was prepared for USAID by Price Waterhouse of Lilongwe in February 1984 (Price Waterhouse, 1984) which confirmed the delays in preparation and submission of claims for reimbursement. It also highlighted issues and made numerous recommendations for actions to be taken by USAID, MOWS, MOH, and Treasury.

A review of the Price Waterhouse Report was sent to the USAID mission by Mr. Paul Kramer, of the USAID Regional Financial Management Center/Nairobi in late February 1984. His analysis of the report was that "...though most of the recommendations from a pure accounting viewpoint may be useful, they do not address the issues as to whether the implementing agency can carry out their recommendations." He further stated "I do not think this level of control (sub-project level reporting) is necessary to adequately manage the project." In general, USAID did not make many substantive changes in its accounting procedures as a result of the Price Waterhouse report. Nevertheless, project implementation has improved, primarily because of improvements in the ability

of the MOWS, the MOH, and Treasury to prepare, to review, and to submit more timely claims for reimbursements and second because of the procedural flexibility of USAID. The dissimilarities of the accounting formats used by USAID and the GOM severely impedes analysis of financial status of project subcomponents. This problem may prove to be especially critical as project funds are drawn down in succeeding months. Significantly, both the mid-term evaluation and the Price Waterhouse report recommended management meetings of ministry, Treasury, and USAID staff. There continues to be a need for a working group to coordinate financial details of the later stages of the project.

A less important issue is that of the duty and surtax on project purchases. The Price Waterhouse report emphasized that the costs of duties and surtaxes were not reimbursable project expenses. Discussions with Treasury indicated that it is the responsibility of the implementing ministry to identify these costs during claim preparation. A potential budgetary difficulty exists for the ministries if these amounts cannot be collected from any source. USAID is currently computing this disallowance.

### 4.1.5 Remaining USAID Input

A summary of remaining USAID input was presented in Table 1. This table is the result of an evaluative rather than an auditing effort, and the absolute accuracy of the figures should be considered in that light. The amounts shown as disbursed or accrued include claims not yet submitted by Treasury to USAID as well as pending items which were identified through project documents and discussions with USAID and GOM officials. This table can serve as a basis for end-of-project financial management by a working group. Subsidiary worksheets are being supplied to USAID staff. These can be used in conjunction with the 1986-87 Annual Construction Plan and the HESP Annual Work Plan to generate a Project Implementation Letter (PIL) to facilitate program management.

## 4.2 Input by the Government and People of Malawi

Actual and projected inputs by the government and people of Malawi amount to dollar equivalents of $1,654,000 through December 1987 and $1,999,000 through December 1988. This compares to a total of $2,000,000 anticipated in the Project Paper and the Grant Agreement. The components of these inputs are detailed in Table 8.

As noted in Table 8 that GOM salary inputs exceeded project expectations. This is a continuation of the pattern evident at the mid-term evaluation, in which a higher proportion of staff occupied established (GOM-funded) rather than temporary (USAID-funded) positions. The Project Paper did not anticipate salary inputs on the part of MOH. The MOH, however, assumed the salary costs of the Principal Health Coordinator in July 1984 and has provided HESP services through the part-time efforts of 93 health surveillance assistants. In contrast, overhead support by the MOWS has been reduced due to a smaller number of senior staff receiving housing subsidies in the later stages of the project than had been projected. Another unanticipated input has been MOWS funding of major maintenance through its revenue account.

Table 8

**Input by the Government of Malawi**

(Thousands of Dollars)

| Input | Anticipated by Project Paper | Actual and Anticipated Through 12/87 | Additional if Project Continues Through 12/88 |
|---|---|---|---|
| Salaries of Headquarters Staff (MOWS) | $ 178 | $ 290 | $ 27 |
| Salaries of Staff (MOH) | 0 | 240 | 69 |
| Overhead Support (MOWS) | 189 | 110 | 8 |
| Overhead Support (MOH) | 0 | 43 | 8 |
| Major Maintenance - Project Rehabilitation (MOWS) | 0 | 244 | Unknown |
| Subtotal - GOM Inputs | $ 367 | $ 927 | $ 112 |
| Self-help Labor - Construction | 1,633 | 837 | - |
| Self-help Labor - Maintenance | Included above | 93 | 23 |
| Easement Costs | 0 | 7 | - |
| Total - GOM and people of Malawi Inputs | $2,000 | $1,864 | 135<br>1,864<br>$1,999 |

The monetary figure for self-help construction labor is significantly lower than that anticipated in the Project Paper. Although the labor inputs were provided as required, the difference in value can be explained as a result of fluctuating exchange rates and a change in the method of assessing such inputs. The self-help inputs in Table 8 were computed as follows: (1) for construction, a rate of MK 0.50 per meter of pipeline trench has been established as the norm by the MOWS. The project will construct 2,060,000 meters of pipelines. This figure can be converted to US dollar equivalent of $837,000 with the exchange rate factor of 1.23 shown in Table 9. (2) For routine maintenance, a study by the Centre for Social Research in Zomba (Msukwa, 1986) estimated annual self-help contributions to be MK 0.16 equivalent per capita. When applied to an estimate of the growth of population served over the life of the project, a total of $93,000 equivalent for the period ending December 1987 is calculated with another $23,000 for the following year if the project continues to December 1988. This estimate of the value of self-help input is somewhat lower than the 30 percent of total construction and maintenance costs imputed to self-help labor by the Project Paper.

The value of contributed easements for pipelines was not separately assessed in the Project Paper. Discussions with the Land Valuation Staff indicated that at the time of the final evaluation rural land in Malawi was worth approximately MK 50 per hectare. This represented the average between cleared land at MK 100 per hectare and open land with basically no market price. The project requires a total of 206 hectares of easement for the 2,060,000 meters of pipelines (one square meter per meter of pipe). An estimated value of MK 35 per hectare was used in the calculation to reflect the average over the life of the project.

Exchange rate fluctuations over the life of the project have had a great effect on the relative dollar value of the Malawi Kwacha, as shown in Table 9. The exchange rate has fallen from MK 0.81 per dollar at the start of the project in 1980 to MK 1.823 per dollar at the time of the final evaluation in May 1986. The rates shown for 1980 to 1983 were taken from the mid-term evaluation and for 1984 to 1986 were the average of buying and selling rates of the National Bank of Malawi on April 1. The 1986 figure was used to estimate the rate for 1987-88.

Table 9

**Exchange Rates for Project Life**

| | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | Average (1980-1986) |
|---|---|---|---|---|---|---|---|---|
| Rate in Effect (MK/$1) | 0.81 | 0.90 | 1.08 | 1.14 | 1.315 | 1.53 | 1.823 | 1.23 |

As shown in Table 8, the government and people of Malawi will have made dollar equivalent contributions of $1,999,000 by December 1988, which is the amount agreed upon in the Grant Agreement. Because of exchange rate fluctuations, however, the Malawian inputs, assessed in terms of Kwacha, have had to be increased over the originally projected levels in order to equal the $2,000,000 equivalent level. This can be shown in the following calculation:

| | | |
|---|---|---|
| 1980: | Projected Malawi Input | = $2,000,000 (equivalent<br>= MK 1,620,000 @ MK 0.81/$1.00 |
| 1987: | Actual and Anticipated Input | = $1,864,000<br>= MK 2,293,000 @ MK 1.23/$1.00 |
| 1988: | Additional Year Input | = $135,000<br>= MK 246,000 @ MK 1.823/$1.00 |
| | Final Malawi Input | = 2,292,000 + 246,000 = MK 2,539,000 |

Thus, Malawian input by the end of the project will have totaled more than MK 2.5 million compared with the MK 1.6 million projected in 1980. The conclusions arising from the foregoing analysis are that the government and people of Malawi have contributed to project inputs at levels which compare favorably to project targets.

## 4.3 Other Inputs

Although not anticipated in the Project Paper, the project has benefited from input from other sources, as summarized in Table 10. Input has included commodity assistance in the form of pipes for the original Chitipa project area by the Japanese International Cooperation Agency, and three pick-up trucks for transporting materials and staff by UNICEF. Long-term salary support for senior project staff and individuals involved in research and evaluation was supplied by the governments of the Netherlands and the United Kingdom and by the Voluntary Services Overseas (UK) and the Peace Corps (US). In addition, the Bureau for Science and Technology of AID has funded three major project-related activities through the WASH Project. In total, $1,130,000 in other inputs has been contributed to the project.

Table 10

**Project Inputs from Other Sources**

(Thousands of Dollars)

| Source | Inputs | | |
|---|---|---|---|
| | Commodities | Vehicles | Professional Services |
| Government of Japan | $670 | | |
| Government of Netherlands | | | $ 90 |
| Government of United Kingdom | | | 165 |
| VSO/Peace Corps | | | 40 |
| UNICEF | | $20 | |
| USAID Bureau for Science and Technology | | | 145 |
| Totals | $670 | $20 | $440 |
| Grand Total | | $1,130 | |

4.4 Summary of Project Input

Table 11 summarizes project inputs from all sources in dollar equivalents.

Table 11

**Summary of Project Inputs from all Services Anticipated through December 1988**

| Source | Amount | Proportion of Total |
|---|---|---|
| USAID | $6,000,000 | 67.0% |
| GOM | 927,000 | 10.1 |
| Community | 937,000 | 10.1 |
| Government of Japan | 670,000 | 10.1 |
| Government of Netherlands | 90,000 | 1.0 |
| Government of United Kingdom | 165,000 | 2.0 |
| VSO/Peace Corps | 40,000 | 0.5 |
| UNICEF | 20,000 | 0.7 |
| USAID (Bureau for Science and Technology) | 145,000 | 1.6 |
| Total | $8,994,000 | 100.0% |

## Chapter 5

## PROJECT OPERATION: INSTITUTIONAL DEVELOPMENT

### 5.1 Project Development Activities of the Ministry of Works and Supplies

Rural gravity-piped water supply schemes are developed and implemented by the Rural Water Section of the Water Department within the Ministry of Works and Supplies.

#### 5.1.1 Water Systems Planning

Planning consists of the decision-making processes necessary to prepare project proposals for funding and to establish implementation schedules for project development activities. These processes include project identification, the determination of technical feasibility, proposal preparation, and construction scheduling.

As reported in the mid-term evaluation, the Rural Water Section (RWS) has responsibility for basic project planning and shares overall decision-making with other GOM organizations and local authorities. This process has evolved over the past 18 years into a well-established set of procedures which, since 1980, have incorporated USAID review, approval, and funding requirements. New projects have traditionally been initiated as a result of requests from district development committees and the Ministry of Agricultural and Natural Resources, parliamentary inquiries, or continuing investigations within the RWS. Most projects undertaken since the onset of USAID funding were initially selected from the backlog of requests existing in 1980.

Overall project development follows a seasonal cycle conditioned by the GOM fiscal year and the need to limit field activities during the November to April rainy season. The planning process in the RWS begins with a preliminary feasibility report on the technical aspects of the requested project, followed by departmental review, additional field studies, when necessary, and funding review. Before the USAID-financed program, large projects were routed by way of Treasury to international funding agencies, while small projects were generally earmarked for internal GOM funding.

Since the advent of USAID funding, the RWS has prepared an Annual Construction Plan for review and approval by USAID. This plan includes engineering designs, population estimates, and implementation schedules for each scheme, progress reports, and financial statements. Technical review of the plan is normally carried out by the USAID Regional Economic Development Services Office (USAID/REDSO) in Nairobi, Kenya, and final USAID approval for funding is given to Treasury in the form of a Project Implementation Letter. In general, there has been a high degree of approval by USAID of the Annual Construction Plans. The main exception to this is the Zomba South project, which was only conditionally approved by USAID in 1983 because of the need to construct a large dam rather than the simple stream intakes of other schemes. Since 1983, the Zomba South project has remained in a state of uncertainty pending resolution of who will build the dam.

The planning procedures described above have worked quite well for both the Water Department and USAID. Cooperation between the two organizations has been good, and the required reports, reviews, and approvals have taken place, although not always according to established schedules.

Although the process described above has worked well in the past for immediate project planning, the RWS has not carried out any long-term planning and has no capability to do so at present. Previously, most planning was in response to requests and little attention was given to long-range objectives, priorities, or development programs. This has left the RWS in the present state of having no future program beyond the current USAID-financed project, with the exception of the Mpira/Balaka scheme, which is being jointly developed with the Urban Water Section. The current design and construction program will continue for perhaps another 18 months before all USAID projects are completed.

To maintain the capabilities of the RWS and to continue the growth of the low-cost piped rural approach begun almost ten years ago, the MOWS needs a program of project development following the completion of the USAID project. This letter should take the form of a plan for developing the remaining surface water schemes in Malawi. Such a plan should identify all remaining catchments having a high potential for gravity pipe schemes and give preliminary estimates of technical requirements and costs. This information will not be available in the National Resources Master Plan, which is being prepared by the United Nations Department of Technical Cooperation for Development, and the MOWS, when it is completed in October 1986. Therefore, it is recommended that USAID use current project funds, drawing from the construction account, to carry out a study of the potential for future rural piped water projects.

### 5.1.2 Water Systems Design

Design consists of the engineering techniques necessary to determine final technical feasibility and to prepare construction drawings and estimates of materials needed and their associated costs. This work is normally undertaken within the RWS by project engineers who are stationed both in the regions and at headquarters. At present, however, the RWS staff has only two engineers at headquarters and none in the field. All water systems design is carried out by these two individuals with the assistance of field supervisors on routine matters, most of whom hold engineering diplomas from the Polytechnic in Blantyre. Project design is undertaken after review and approval of the preliminary feasibility report by the water department.

As reported in the mid-term evaluation, the procedures for project design are based upon accumulated program experience which has been documented in a design manual (Department of Lands, Valuation and Water, 1983a). Although not an engineering textbook, the manual provides criteria and procedures for the design of the main technical elements of the rural piped systems. Standard designs and type drawings are used for common system elements, such as intakes, tanks, and tap aprons. The gravity flow nature of the schemes allows extensive use of standardized designs and system components. A few of the key design criteria are the following:

1. **Water consumption** = 36 lcd, all from public taps (before 1983 a design figure of 27 lcd was used).

2. **Pipe material** = PVC for all lines, except for some use of steel around intakes, tanks, and taps.

3. **Service population** = 1977 census population + 2.6 percent annual increase over 20 years.

4. **Walking distance to taps** = 500 meters (maximum), but 90 percent of the houses are within 200 to 300 meters.

At the time of the mid-term evaluation, rural systems were designed and approved exclusively within the RWS. Now they are reviewed, along with urban schemes, by the Design Section of the Water Department. This approach has resulted in several changes in RWS design procedures, including the adoption of a new formula for pipeline flows (to bring rural design in line with existing urban practice) and the inclusion of additional reinforcing steel in storage tank design. The adoption of new design procedures and the requirement for review by the Design Section have generally strengthened rural water designs and have made the RWS more technically accountable to the Water Department than previously. In the future, officials of the Water Department intend to require all young engineers to spend time on the design of both rural and urban schemes.

### 5.1.3 Water Systems Procurement

Each subproject is constructed under the supervision of RWS staff, using local self-help labor with supervision and skilled labor for some items, such as tanks and treatment works contracted to local builders. The materials for all subproject components are financed by the USAID grant, with the exception of a commodity grant of the PVC piping for the main Chipita subproject. Construction equipment and vehicles for transport are purchased directly by USAID for the project after approval by the GOM Central Tender Board, which obtains quotations from suppliers acceptable to the MOWS. PVC pipe, the major item of expenditure, is also purchased directly by USAID. Each pipe consignment receives approval from the Controller of Stores and the Central Tender Board.

A comprehensive review of procurement procedures and practices was undertaken by Price Waterhouse of Lilongwe in January 1984. The firm found only minor technical weaknesses in procedures in the course of its review. The evaluation team also reviewed current procurement practices in the MOWS and found that no significant changes have occurred since the 1984 Price Waterhouse report. The main procurement recommendation by Price Waterhouse was that fresh quotations from various suppliers for pipes and fittings be obtained annually. Since local procurement in Malawi has had only minimal increases in price over the past few years, external quotations have not been obtained. The evaluation team nevertheless believes that at least one tender for quotations should be obtained prior to the start of any follow-on project.

In certain cases, waivers for the purchase of equipment, vehicles, and pipes have been required, and USAID files indicate that such waivers have been obtained. These items involve direct purchases by USAID. All instances of waiver requests appear to be well justified and properly obtained.

During the field visits, only one procurement issue was noted. MOH staff indicated some difficulty in obtaining a reliable supply of cement for the construction of washing slabs. By transferring the construction of the slabs to the MOWS, some logistical problems can be reduced. In reviewing future construction schedules, the availability of cement may be an issue deserving attention.

In general, the team found procurement to be handled effectively and efficiently. A well-established and accountable system is in place and has proved its ability to supply needed inputs at reasonable cost, with a high degree of reliability. This is evidence of a strong, institutional capacity to execute the remainder of the current project and to undertake future projects.

### 5.1.4 Water Systems Construction

As described in the mid-term evaluation, construction activities are highly dependent upon seasonal factors. In general, intake construction occurs in the dry period, August to October, before the rainy season. Marking of the pipeline route takes place in October, before planting, and the main trench digging program begins in February-March during a lull between planting and harvesting. In the normal course of events, the main program of pipe laying begins in May-June and continues as long as necessary in the dry season. Self-help village labor is used for pipeline marking, trench digging, pipe laying, and backfilling. Contractors with paid laborers are used for the construction of reinforced concrete tanks.

In the past, the rural schemes profited from a unique RWS practice whereby the engineer who designed a system usually remained in the field in direct charge of overall construction. The current level of only two engineers, however, has necessitated the shift of construction supervision responsibilities to field staff holding positions of senior technical officer, technical officer, or senior technical assistant. These staff carry out a large part of project construction management as well as day-to-day direction and supervision of construction activities. Field supervisors are assisted by one or more water project operators who are responsible for directing the self-help activities of the villages and monitoring the progress of paid contractors. During construction, weekly progress reports are prepared by water supervisors and sent to the project engineers. After completion of construction, one of the rural water operators becomes a monitoring assistant who is permanently posted to the scheme and is responsible for routine inspections and training of the villagers in maintenance and minor repairs.

Visits by the evaluation team to several project sites, both completed and under construction, showed that the supervisory procedures described above are followed and that the quality of construction was generally quite high.

### 5.1.5 Promotion of Project Committees

Engineers and field supervisors of the RWS are responsible for promoting the establishment of project-related committees. During the initial planning phases, RWS personnel meet with community leaders and village inhabitants and explain to them what is needed in terms of local contributions and community participation. Project communities are given guidance in setting up the various committees needed to implement and maintain the project, including:

| | |
|---|---|
| Project committee | - responsible for overall coordination of project communities |
| Section/branch committees | - responsible for construction of local branch of pipeline and associated taps |
| Tap committees | - responsible for cleanliness around tap apron and for enforcement of water use rules at the tap |
| Repair teams | - responsible for minor maintenance and repairs to pipelines and taps. |

The project and section/branch committees are organized for the purpose of coordinating construction activities, while tap and repair committees are needed after the project becomes operational. Supervisors and rural water operators direct most construction activities through volunteer leaders of local committees. If committees are slow to act, or if insufficient volunteers show up to carry out an activity, progress on the project is delayed correspondingly. Construction progress, therefore, is subject to the enthusiasm and response sustained by the local committees. Given the uncertainties inherent in self-help activities, this procedure works reasonably well. On the negative side, construction schedules occasionally slip because of inadequate turnouts, but on the positive side, communities participating in the project come to learn that their efforts are the main factor in project implementation and, as a result, they develop a strong sense of ownership of, and responsibility for, the system.

## 5.2 Project Development Activities of the Ministry of Health

The Health Education and Sanitation Promotion[1] (HESP) component of the project is executed by the Environmental Health Division of the Ministry of Health. The administrative and technical organization of the MOH is shown in Figures 5 and 6, and the internal organization of the Environmental Health Division in Figure 7.

[1]It has been proposed that the name be changed to Hygiene Education and Sanitation Promotion Project, to avoid confusion with the Health Education Unit of the Ministry of Health.

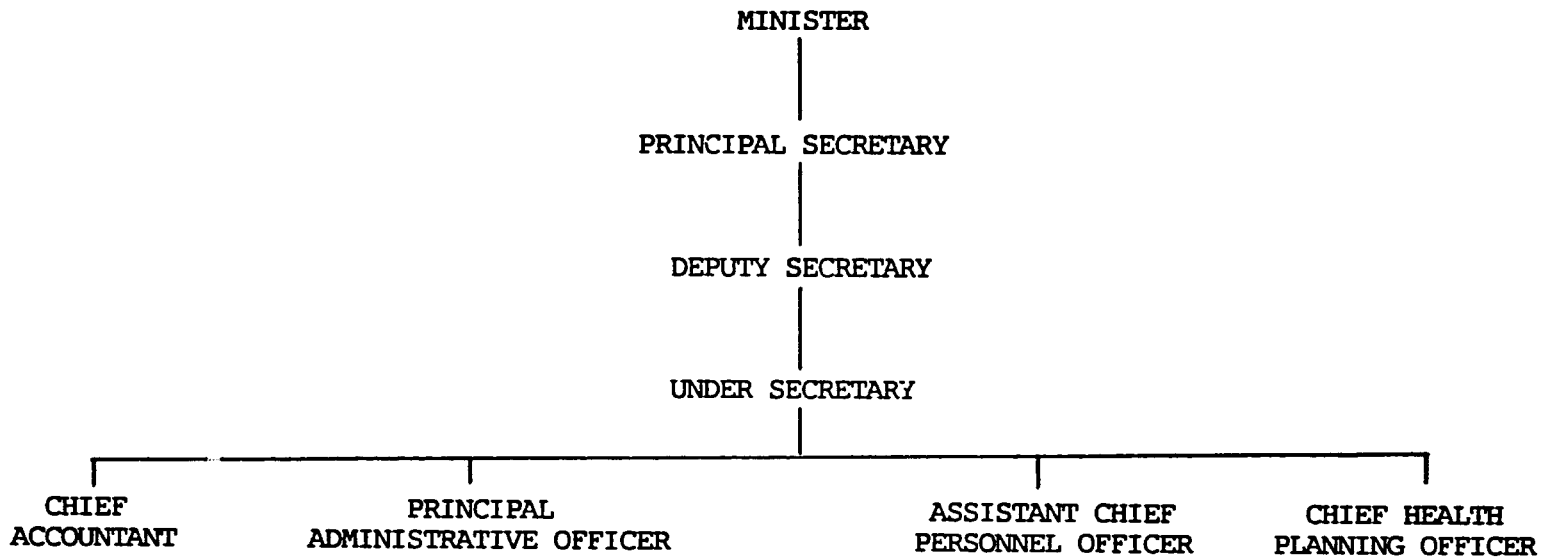


Figure 5. Organization of Ministry of Health - Administrative

(Source: Government of Malawi, WHO and UNICEF, 1984)

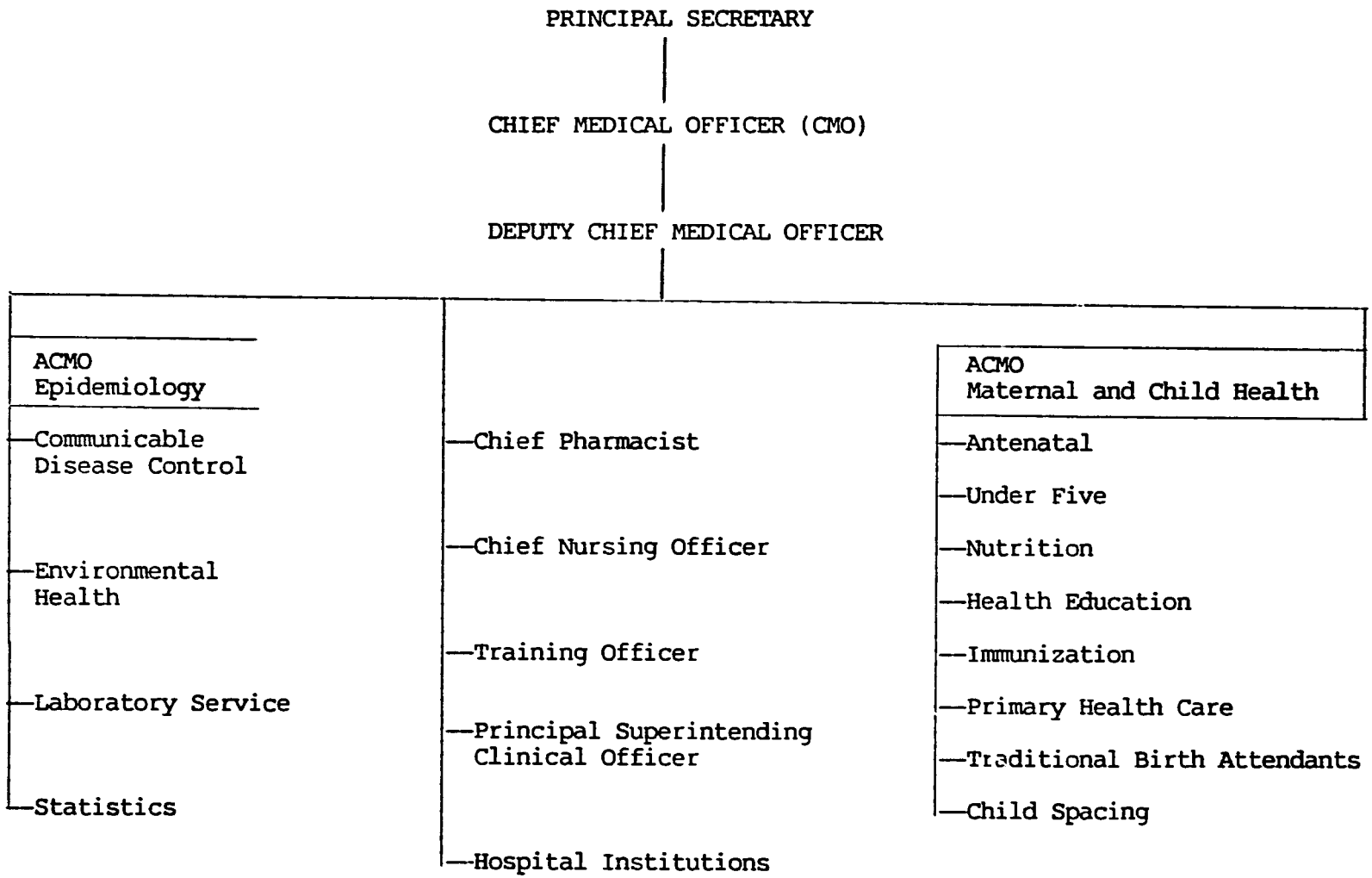


Figure 6. Organization of Ministry of Health - Technical

(Source: Government of Malawi, WHO and UNICEF, 1984)

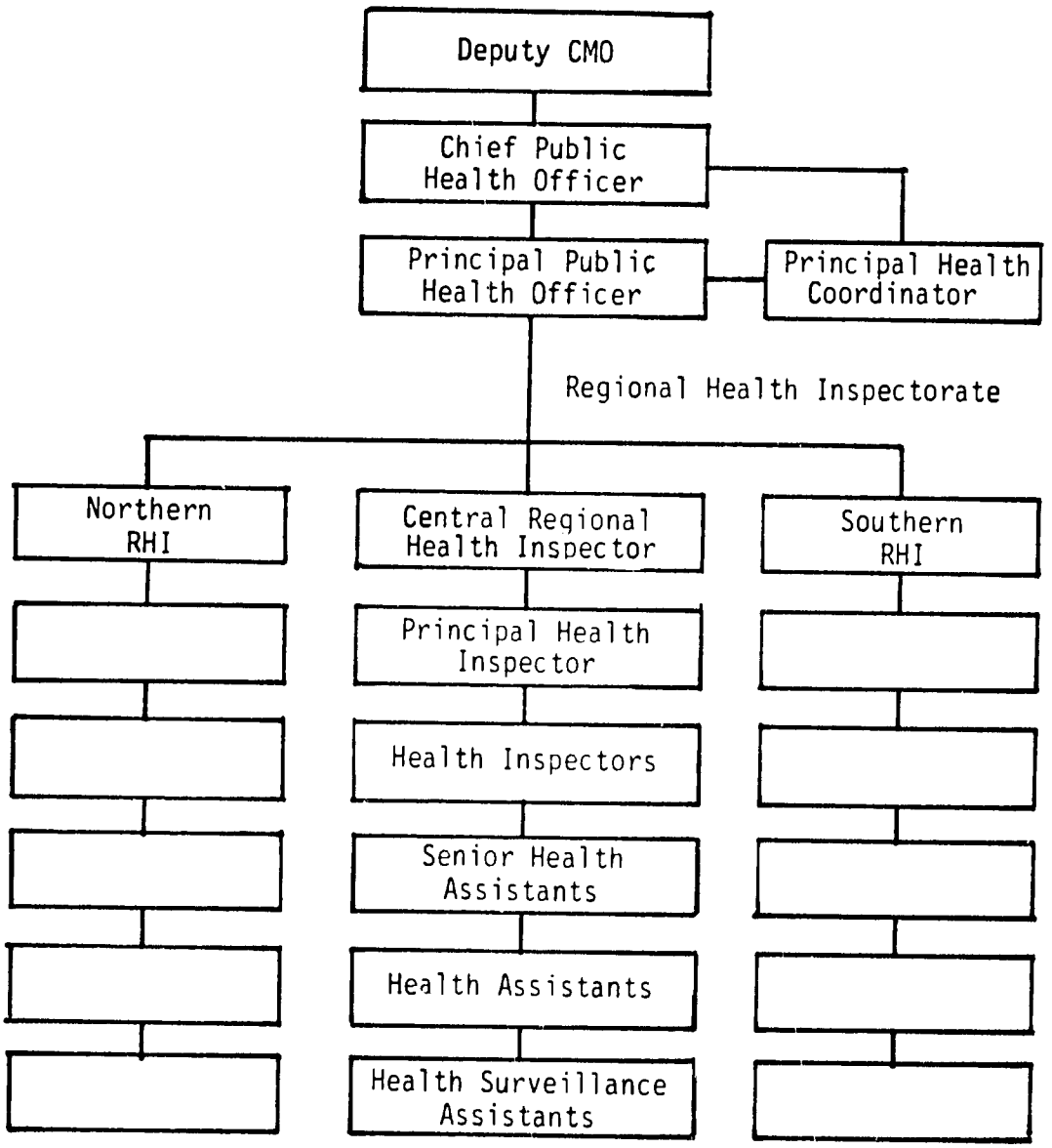


Figure 7. Organization of the Environmental Health Division, Ministry of Health

### 5.2.1 Activities of Environmental Health Personnel

Environmental health activities are directed by a small headquarters staff and by larger regional and district staffs. Field activities are under the direct control of district officials. District health inspectors (DHIs) and health assistants (HAs), who in turn are supervised by the district health inspectors, have responsibility for all preventive services, including maternal and child health, nutrition, immunization, and environmental health. Health assistants often help run the nutrition clinics of rural hospitals and health centers, as well as supervise the health surveillance assistants (HSAs) and, through them, act as the main link between the village health committees (VHCs) and the health service. Health surveillance assistants, too, have a broad job description, spending perhaps half their time assisting in clinic-based activities and half their time on a variety of activities with the village health committees. Hygiene education and sanitation promotion are but a few of many environmental health responsibilities of these field personnel.

### 5.2.2 Activities of the Principal Health Coordinator and the HESP Component

The Principal Health Coordinator (PHC) occupies two central roles in the project. First, he has primary responsibility for coordination of project activities involving the Ministry of Works and Supplies and the Ministry of Health and, second, he is responsible for the HESP component within the MOH.

The original PHC (an expatriate paid out of project funds) held the post from July 1982 until August 1984. Upon his resignation, the post was taken over by a health supervisor in the Ministry of Health. Because he is a health superintendent with an established position, his salary has been paid by the MOH. The transition was smooth, with several months of overlap providing for the transfer of responsibilities.

HESP activities have been focused in 13 areas having rural piped water supply projects (7 of which are USAID-funded). In these areas, HESP has worked with existing health assistants (HAs) and health surveillance assistants (HSAs), providing them with additional training (described in more detail in Section 5.4.4) and some resources. (Staff deployed to HESP are described in more detail in Section 5.4.3). The HSAs are assigned a ten-village area in which to concentrate their HESP work. From among the ten designated villages, they choose several high potential communities in which to concentrate their efforts. This approach results in progress, which boosts the morale of the HSAs and serves as a model which they can later duplicate in other villages.

The construction activities of the HSAs in the HESP program concentrated on washing slabs and pit latrines in a few "target" villages chosen from the ten villages served. To date, 103 washing slabs have been constructed, with cement and supervision provided by HESP (from both USAID and UNICEF funds) and labor and other materials provided by the villagers. From both a limited formal assessment conducted by the Department of Water (Easton, 1985a) and informal information gathered during the review of maintenance at rural piped water projects (Msukwa, 1986), it is evident that washing slabs are popular among the villagers and there is a strong demand by village women for the

construction of more slabs. Because the cash input into the washing slabs is relatively high (MK 40 for four bags of cement), few, if any, washing slabs have been constructed by villagers (who have an average cash income of just K29 per capita per year (Msukwa, personal communication)) with their own funds.

Regarding pit latrines, improved sanitation is a high priority for VHCs, (GOM, WHO, UNICEF, 1984), and HESP appears to have been successful in stimulating villagers to construct latrines (see Section 6.2.5). A recent survey of VHCs showed that latrine construction was at the same time their greatest success and their greatest problem (GOM, WHO, UNICEF, 1984). It appears that villagers can be mobilized to construct latrines (with national rural coverage currently 55 percent), but there are a large number of latrines which collapse each year during the rainy season. While the HESP program has played an important role in introducing improved excreta disposal technologies (specifically the ventilated improved pit latrine), the primary problem appears to be a structural one requiring further applied research. The Low-Cost Sanitation Demonstration Project, being carried out in urban areas by the Department of Water (with funds from a World Bank loan), has developed a latrine slab which requires just one-eighth of a bag of cement and two reinforcing rods. If these materials were to be provided from project funds, it is probable that villagers would willingly contribute the aggregate and labor necessary for the manufacture of low-cost slabs. In the opinion of the evaluation team, the advisor to the Low-Cost Sanitation Demonstration Project should be called upon by HESP for technical advice regarding the problem of collapsing latrines.

The overall performance of the HESP program can be judged by several criteria, depending primarily on the time horizon used. A primary criterion is whether the primary goals of the HESP component (described in Section 2.2) have been reached. Certainly the qualitative objectives, to strengthen and coordinate the rural water supply program with the MOH and to train Malawians in basic health and sanitation education, have been met. Regarding the quantitative goal of exposing 202,000 villagers to hygiene and sanitation education, it appears that the target has been exceeded. Ninety-two HSAs are deployed under HESP, each serving ten villages. If the average population reached in each village is 300, then the total population reached is approximately 270,000.

The only project goal which has not been reached is the one calling for focused health education activities in sanitation and hygiene within each of the locations receiving rural piped water. The HESP project does not reach all subproject areas (more than 50 in all) or even all USAID-funded schemes (20 in all), but instead has focused on seven USAID-funded areas. This departure from stated project goals was necessary in the formative years of the HESP program when personnel resources were inadequate for the task.

In terms of a major goal of the HESP project, namely, the achievement of long-term sustainability of HESP activities within the MOH, the project has been a success. Largely because of the enthusiasm and competence of the Principal Health Coordinator and the training and support activities undertaken under his direction, HESP has acquired a reputation within the Ministry, among the field staff, and among observers of rural development in Malawi as an outstanding success. It is widely viewed as the most successful MOH activity in

terms of improving the morale and performance of HSAs. Demand from field staff for HESP to extend its training and support activities to other areas is strong. Within the MOH, HESP is no longer regarded as a particular program which will terminate upon completion of the present USAID project, but rather as an activity which should be continued indefinitly.

One measure of this commitment is the degree to which the MOH has mobilized funds for extension of HESP activities beyond those funded by USAID. Two such externally funded HESP projects have been initiated in 1985. WHO and UNICEF have funded a $92,000 project for construction and rehabilitation of shallow wells, construction of washing slabs, and construction of 110 pilot VIP latrines into six districts served by USAID-financed schemes. UNICEF has funded a four-year $267,000 HESP project for training and supporting 50 HSAs in low-cost methods of construction and hygiene education in groundwater areas.

A major concern in the HESP program is over-extension of the Principal Health Coordinator. For the HESP activities to be carried out successfully over the remainder of the USAID project, it is essential that the MOH appoint a staff member of the rank of senior health inspector or higher to work with the PHC on HESP activities.

The Principal Health Coordinator has prepared a request for additional USAID funds for the remainder of the project. Approximately MK 140,000 annually has been requested for transport (including bicycles for HSAs and fuel), and approximately K 80,000 for training and supervision activities. This request, possibly augmented by additional funds for the purchase of cement for the construction (with self-help labor and locally-provided aggregate) of washing slabs and low-cost latrine slabs, appears to be reasonable provided the funds are available and the staff reinforcement discussed above occurs.

### 5.2.3 Promotion of Village Health Committees

Village health committees were started in Malawi in the 1970s when cholera epidemics occurred. It was hoped that they would form the structure needed for further development of community-based health care. It is believed (see GOM, WHO, UNICEF, 1984) that most villages have health committees, but it is widely recognized, however, that in many instances the VHCs are not functioning effectively. In many cases, the VHCs are thought of as little more than "a quick way of mobilizing children for immunization", and "are not sufficiently aware of the role that a health committee could play in health improvement" (GOM, WHO, UNICEF, 1984). In a survey conducted as part of the Joint Programme Review of Primary Health Care Activities (MOH, WHO, UNICEF, 1984), it was found that half of the VHCs had not met at all in the previous six months and the majority maintained no records. This weakness of the VHCs is recognized as a major impediment to the participation by the villagers in primary health care activities. For example, an evaluation of the low level of immunization coverage in Malawi points out the lack of effectiveness of the VHCs as a reason for the high drop-out rates (Shafa, 1985).

In attempting to strengthen VHCs, health surveillance assistants have a major role to play, because it is they who act as the link between the VHCs and the formal health services. As part of the HESP program, HSAs in the HESP areas

have received training not only in technical areas (such as washing slab and latrine construction) but also in assistance in strengthening the VHCs.

While objective information on the functioning of VHCs in HESP versus non-HESP areas is unavailable, evidence exists that these activities have been highly successful. First, because water supply and sanitation were singled out as "priority problems" for VHCs by the Joint Programme Review of Primary Health Care (MOH, WHO, UNICEF, 1984), it is likely that greater water and sanitation activities with these committees would be effective. Second, as word has spread among MOH field staff about the content of HESP training and support activities, a strong demand has arisen among HSAs, HAs, and health inspectors to be included in these functions. It is in part because of this demand that the MOH has obtained additional funds from WHO and UNICEF to extend HESP activities to other areas. Third, although an institutional review carried out for USAID by the Centre for Social Research did not specifically address HESP (Msukwa, 1986), the principal investigator for the study had the strong impression that VHCs were functioning better in the HESP areas than in non-HESP areas (Msukwa, personal communication). Finally, as discussed in detail later in this report, there is strong evidence that activities (such as latrine construction -- see Section 6.2.5 -- and participation in immunization programs -- see Section 8.1.3), which depend on the VHCs are substantially stronger in HESP than non-HESP areas.

## 5.3 Water Systems Maintenance

### 5.3.1 Routine Operations and Maintenance

Routine operations and maintenance on the water systems are the responsibilities of the repair teams, which work under the general direction of the RWS supervisors and the monitoring assistants. Repair teams are composed of six to ten local volunteers, often one from each village along a pipeline. These teams initially receive one day of training from RWS field staff followed by on-the-job review on an as-needed basis.

Repair team members, almost all of whom are men, are usually selected by local chiefs or identified during the construction period. Repair teams are expected to repair PVC pipe breakages, to replace taps, and to repair broken aprons around taps. Usually they must carry out minor repairs without any direct supervision of the monitoring assistant. They use their own simple tools, but can obtain spanners (when needed) and supplies (replacement pipe, taps, and PVC solvent) from the monitoring center located in each subproject. Most repair supplies are provided free, but replacement taps must be purchased by the local community at a cost of MK 5.00 ($2.75) each. Tap committees report operational problems to repair teams which, in turn, give periodic reports of their repair activities to the local monitoring assistant.

In addition to the work of repair teams, inhabitants of project villages are expected to rebuild the earthen ridge over the pipeline route every year.

The performance of volunteer repair teams appears to be quite successful at routine maintenance and repair, which keeps small problems from becoming large ones and thereby minimizes the eventual maintenance costs which fall on the RWS and the central government. According to an internal RWS report (Easton,

1985d), most pipe breakages are repaired in two days or less. Local participation in tap committees and repair teams serves to promote an attitude of community concern for the well-being of a water system, which results in fewer overall maintenance problems. For example, the evaluation team was told that only 6 out of 187 taps have needed replacement and no concrete aprons have required any repairs in the two years since the Champhira North subproject was completed. Overall, the evaluation team finds the division of maintenance responsibilities between the local communities and the RWS to be both reasonable and effective.

### 5.3.2 Major Maintenance

Major maintenance activities include the replacement of pipelines and the repair of river crossing, washouts, and damaged intakes. Such activities are beyond the capabilities of local pipe repair teams. The RWS has technical and financial responsibility for all major maintenance, although communities are required to provide self-help labor where such inputs are appropriate.

In general, major maintenance is necessitated by an unexpected event, usually a severe flood which washes away a section of pipeline. The most serious event to date occurred in the Mwaiza Project in early 1986, when an unusually high flood washed away several kilometers of the main pipeline. Repair of major washouts requires engineering redesign, construction supervision, and replacement materials equivalent to or better than those used in the original project construction.

The evaluation team does not find the frequency or severity of washouts indicative of any general deficiency of design or construction techniques. Given that gravity flow rural schemes must cross numerous streams and that few such streams have hydrologic records which are adequate for flood analysis purposes, it is not surprising that occasional severe storm events will cause some damage to pipelines and intakes. Nevertheless, while the evaluation team Does not see a need to institute any changes in general design procedures at this time, major washouts should be reviewed to determine how such problems can be avoided in the future.

Another aspect of major maintenance involves the replacement of AC pipes with PVC pipes in several older projects in the Mulanje area. Much of this work is done under the augmentation account, which contains $380,000 of USAID funds. Like all schemes built before the onset of the current USAID-financed project, the Mulanje schemes had AC pipes for all mains and branch lines. Because of highly aggressive waters, however, which tend to dissolve the AC materials, and highly expansive black cotton soils, which tend to break the relatively brittle AC pipes, the water department has decided to replace all, or nearly all, of the AC mains in the Sombani, Phalombe, and Namitambo projects with PVC pipes supplied under the USAID project. This work began in 1983 in the Mulanje area and will continue for at least another year in the foregoing areas. The evaluation team believes that the expenditure of USAID funds to replace deteriorating AC pipes with PVC pipes is an effective use of project resources. Because of continuing problems with AC pipes in projects in the Mulanje area, it may be necessary for the RWS eventually to replace all of them with PVC pipes.

The problem of pipeline replacement points out the need for more realistic assessments of the likely life spans of project components (pipelines, tanks, taps, and so forth). To date, little thought has been given to the future replacement of project components; therefore, such components are implicitly assigned an infinite life span.

Before the 1984-85 fiscal year, the Water Department had no specific budget for major maintenance of rural schemes. The few repairs needed before then were made with commodity aid materials provided by the Government of Japan and other donors. Starting in 1984, however, Treasury has approved the following maintenance budgets from the GOM recurrent account:

1984-85 - MK 250,000
1985-86 - MK 370,000
1986-87 - MK 230,000

The foregoing budgets were intended to serve both urban and rural water projects. No breakdowns are available for amounts spent on rural piped schemes. As the overall rural piped program continues to expand, there will be a growing need to institutionalize a major maintenance budget as part of the GOM recurrent account.

### 5.3.3 Financing of Maintenance Costs

Recurrent Costs Incurred

The costs incurred in maintaining rural piped water supply systems in Malawi are met from a variety of sources. For routine maintenance, the communities themselves provide cash (primarily for the payment of caretakers) and volunteer labor, whil the Water Department pays for the cash costs of most replacement parts and for the salaries of supervisory personnel. For major maintenance items, the Water Department provides (in part from the revenue account and in part from project funds) both materials and manpower, usually supplemented by village self-help labor.

As part of the evaluation of institutional aspects of maintenance of the rural piped water projects (Msukwa, 1986), detailed information was collected on community inputs (both cash and time) into five rural systems. Water Department records for these systems were examined to determine the inputs made by the department for both routine and major maintenance. These data are summarized in Table 12 on the following page.

The conventional way of discussing the information on Table 12 would be to present per capita costs of operation and maintenance and to assume that these costs can be applied to other rural water supply schemes. For existing schemes this is probably a reasonable assumption. When the concern is with the recurrent cost implications of new rural piped water supply schemes, however, the analysis is rather different. As the best sites for rural water projects are used up, the schemes become more costly and complex (for example, some treatment often required, more complex intake structures, more kilometers of pipeline per person served). If historical data of the sort presented in Table 12 are to be used, the appropriate figure in estimating the recurrent costs is

Table 12

Maintenance Costs for Five Rural Piped Water Supply Projects

| Project | Completion Date | Population Served (Estimated 1985) | Capital Cost of Materials 1988 (MK) | Annual Contributions in Kwacha (MK/cap) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Routine Maintenance | | | Major Maintenance | | |
| | | | | Community | | Government | Community | Government | |
| | | | | Cash | In-kind | | In-kind | | |
| Lufira/Karonga | 1983 | 32,700 | 348,000 | 1050 (0.03) | 5040 (0.15) | 1982 (0.06) | 0 (0) | 6500 (0.20) | |
| Ng'onga | 1972 | 4,200 | 16,800 | 210 (0.05) | 4150 (1.00) | 1151 (0.27) | 7 (0) | 100 (0.02) | |
| Mchinji | 1976 | 26,600 | 98,800 | 270 (0.01) | 1930 (0.07) | 2747 (0.10) | 0 (0) | 0 (0) | |
| Sumulu | 1984 | 23,500 | 287,000 | 450 (0.02) | 2940 (0.13) | 1966 (0.08) | 0 (0) | 0 (0) | |
| Mulanje West | 1975 | 102,700 | 340,000 | 1430 (0.01) | 10250 (0.10) | 1827 (0.02) | 70 (0) | 5500 (0.05) | |
| Maintenance Costs in MK/cap/year and (% of total) | | | Mean | 0.02 (6%) | 0.13 (50%) | 0.05 (19%) | 0 (0%) | 0.07 (25%) | Total MK 0.26 (100%) |
| | | | Median | 0.02 (7%) | 0.13 (45%) | 0.08 (31%) | 0 (0%) | 0.05 (17%) | MK 0.28 (100%) |

not the operation and maintenance cost per capita, but the operation and maintenance cost per unit investment in the project.

On this basis, and bearing in mind the tentativeness of any conclusions drawn from so small a sample, the conclusions to be drawn from Table 12 appear to be as follows:

Operation and maintenance costs of existing schemes:

- The maintenance costs are by no means negligible, amounting to about MK 0.26 per person served per year.
- The maintenance costs which have to be met with cash are also substantial, amounting to MK 0.13 per person annually.
- By far the major portion (88 percent) of the cash costs of maintenance are presently borne by the GOM.
- The contribution of major maintenance items (which can be highly variable from year to year and project to project) is substantial, amounting to 50 percent of total cash maintenance costs.

Operation and maintenance costs of new schemes:

- The total capital costs (in 1986 Kwacha) of the five schemes is approximately MK 1,000,000, and the total annual cash cost of maintaining the schemes is approximately MK 25,000. For planning purposes it may therefore be assumed that MK 25 annually are incurred in recurrent maintenance costs for each MK 1,000 to be invested in rural piped water projects. At a per capita cost of MK 14.40 (about the average per capita cost in cash of the present USAID schemes), this implies an annual cash cost for operation and maintenance of about MK 0.36 per person.

Financing of Recurrent Costs

From the above analysis it is evident that the Water Department needs to give serious consideration to means of financing the recurrent cash costs of rural piped water projects if these projects are not to become a drain on the recurrent budget of the GOM.

One possibility for raising revenues to cover the recurrent costs of new systems is to design these systems to allow for private connections and to meter and bill those who choose to connect. To give an idea of the contribution which private connections could make to generating revenues to cover recurrent costs, assume that the charge for water would be MK 0.30 per cubic meter (about the rate paid in urban areas) and that the per capita consumption of those connecting to the systems would be 50 liters per day (about half of the figure used for the design of yard taps in urban areas of Malaŵi). For a project which serves 10,000 people, if 10 percent of the population chose to install yard taps, the revenue generated per annum would be about MK 5,500 annually. If the cash component of the capital cost of new schemes is MK 14.40/capita (about that of the average USAID-funded scheme) and

an interest rate of 10 percent over a period of 20 years is used, then the full costs are approximately as shown in Table 13.

Table 13

**Annualized Cash Costs and Revenues for a Typical New Rural Piped Water Project Serving 10,000 People with 10 Percent Served Through Metered Yard Taps**

(In Kwacha annually)

| Cash Costs | | | Revenues |
|---|---|---|---|
| Operations and Maintenance | Amortization of Capital | Total Costs | Total Revenue |
| MK 0.36 x 10,000 = | MK 14.40 x 10,000 x .1,175* = | | MK 0.30 x 50/1000 x 1,000 x 365 = |
| MK 3,600 | MK 16,914 | MK 20,500 | MK 5,500 |

*Capital recovery factor for 10% interest rate over 20 years.

The foregoing assumptions involve relatively high costs for rural populations having low cash incomes. Nevertheless, if the assumptions can be accepted and metered private connections for new rural piped water schemes are allowed, revenues could be generated which would cover all of the maintenance costs and approximately 11 percent of the cash capital costs of a rural water supply project.

These rough calculations suggest that serious consideration should be given to meeting the recurrent cost obligations of the government and generating resources to cover the capital costs of new or reconstructed rural water projects by allowing for metered private connections in such piped water schemes.

Two other factors need to be taken into account when considering such a policy change. First, part of the success of the rural piped water schemes over the past 18 years has been the egalitarian philosophy underlying the projects: everyone works and everyone receives the same level of service. Private connections have been prohibited, a policy which has been violated only in a few cases. A real possibility exists that the whole spirit which has made the Malawi rural piped water program such an outstanding success could be undermined if private connections were to be allowed. Accordingly, if it is decided to pursue the idea of private metered connections further, this should be done only after extensive consultation with the communities involved and only in a carefully controlled experimental setting at first.

The second problem relates to the demand for private connections in rural areas. While anecdotal evidence suggests that the demand is strong and growing, engineering and financial planning purposes require a detailed

understanding of the effect of connection charges and user fees on the number of private connections that will be made and of the quantity of water which will be used from these connections. It would be wise to conduct some applied research on this issue prior to the design of even an experimental project. This research should involve both a careful analysis of the data being gathered on water use in peri-urban areas of Malawi and the conduct of a series of "willingness-to-pay" surveys in areas which are to be included in the experimental project. The research should also involve an ex-post analysis of actual practice in the experimental project and the specification of a standard methodology for incorporating demand considerations into the design of future rural piped water projects in Malawi.

## 5.4 Staffing and Training

### 5.4.1 Staffing: Ministry of Works and Supplies

The Rural Water Section in the MOWS has established positions for a principal water engineer (P7), a senior water engineer (P8), and seven project engineers. At present, the RWS has only two project engineers, neither of whom are registered yet and, as a result, cannot be promoted to the PWE or SWE positions.

In addition to the foregoing engineering positions at headquarters, a larger number of technical and field-level positions are located throughout the project areas. As of January 1986, the following staffing totals existed:

| Established Positions | Number | Function |
|---|---|---|
| Senior Technical Officer | 2 | Supervisor |
| Technical Officer | 4 | Supervisor |
| Senior Technical Assistant | 8 | Supervisor |
| **Nonestablished Positions** | | |
| Grade I | 8 | Rural Water Operator (RWO) |
| | 15 | Monitoring Assistant (MA) |
| Grade II | 19 | RWO |
| | 10 | MA |
| Grade III | 23 | RWO |
| | 7 | MA |
| Upgraded | 5 | RWO |
| | 1 | MA |

Salaries for all of the nonestablished (field) positions are provided by the USAID grant.

Over the past two years, a loss of engineering staff has reduced the capability of the RWS to respond to immediate project planning needs. Where previously the professional staff of the RWS included two senior engineers plus upwards of six or seven junior engineers composed of Malawi nationals and Peace Corps and VSO volunteers, the current staff has only two Malawian engineers who are de facto responsible for all planning, design, construction, monitoring, and maintenance activities. As a result of these staff reductions,

coupled with the shift of overall responsibilities to the two remaining engineers, the RWS has little capacity for new project preparation. It should be pointed out, however, that the rural piped water program for the first time in its history is under the direct control of Malawian nationals, and the evaluation team is highly impressed with their general performance in handling the diverse aspects of this complex program.

### 5.4.2 Training: Ministry of Works and Supplies

Training of MOWS staff occurs at both the in-service development and professional educational levels. A development program for RWS field staff had been in existence before the advent of the USAID project and has continued with some modifications, to the present. The basic training program involved refresher courses for supervisory and monitoring staff which were routinely offered between January and March. This training activity has been augmented with upgrading sessions to qualify staff for promotional opportunities. Input from the RWS information system is used by the training officer to design the content of the sessions. Although this process was anticipated by the Project Paper to be a responsibility of a research and training officer with a formal Research and Training Unit, neither the position nor the training unit were established by the MOWS. Initially, responsibility for the training component rested with the senior water engineer, but since his departure, responsibility has been transferred to a technical officer who divides his time beween the Zomba Training Center and project supervision in the Mulanje area. This lowering of the technical qualifications of the key training officer combined with budget constraints indicate a need for the RWS to evaluate their manpower situation and the training needs of current and future staff. Such a review should include plans to ensure that adequate training is provided to construction staff to make the transition to monitoring activities.

The Project Paper also assumed that graduates of the Malawi Polytechnic Institute would provide a source of technical expertise for the RWS. Because of income and status differentials between the RWS and alternate employment options, only a few new staff have been drawn from the Polytechnic. Alternate sources of professional staff and training are being explored by the RWS. The ability of the RWS to sustain projects and to extend activities to new areas is highly dependent on its training efforts. A priority need is training of village repair teams which should include efforts to include women on the teams.

### 5.4.3 Staffing: Ministry of Health

MOH staff deployed under HESP include one health superintendent (the principal health coordinator), 11 supervisors (who are either senior health assistants or health assistants), 16 other health assistants (HAs) and 91 health surveillance assistants (HSAs.) This constitutes roughly 20 percent of the HAs and HSAs employed by the MOH. HESP personnel are currently stationed at or near 33 rural piped water sites in 13 districts, including most (but not all) USAID-funded schemes. The Principal Health Coordinator estimates that additional HSAs are required to provide HESP services to all water schemes.

### 5.4.4 Training: Ministry of Health

The training of MOH staff to function as HESP promotors is a major focus of the HESP component. In recognition of the importance of training, USAID has provided two consultancies during the project to provide training-of-trainers (TOT) workshops. These have helped develop a cadre of staff able to transmit the HESP message to MOH staff and "local leaders". Another product of one of the consultancies has been the development of a trainers guide (A Trainer's Guide for Health Education Skills Workshop, available at the WASH Library). With the TOT workshops as the basis of training efforts, a total of 15 additional training sessions have been conducted throughout the country, as shown in Table 14. These training efforts have contributed greatly to the successes of the HESP program. They are seen as morale boosters, and training slots are in high demand among field staff.

Recent developments in the HESP training program have focused on collaborative efforts with MOWS staff. The most recent TOT workshop involved staff from both ministries. The training forum serves to facilitate and expand the collaboration of field staff, which is a positive development in light of health research findings which indicate that benefits are in large measure dependent on both improved supply and behavioral changes. The community development skills which have contributed to the success of construction activities are being shared and refined by joint efforts of the MOH and MOWS. Unfortunately, constraints in both senior and field level staffing reduce the diffusion of training and the coverage of those who have been trained.

## 5.5 Community Support

### 5.5.1 Status of Committees

A well-organized committee structure is the cornerstone of the rural piped water program. Committees are divided into two types -- construction committees and maintenance committees. The construction committees include the main water, section, branch and village committees. The maintenance committees include the main water, repair team, and tap committees. Figure 8 illustrates the committee hierarchy for construction and maintenance committees.

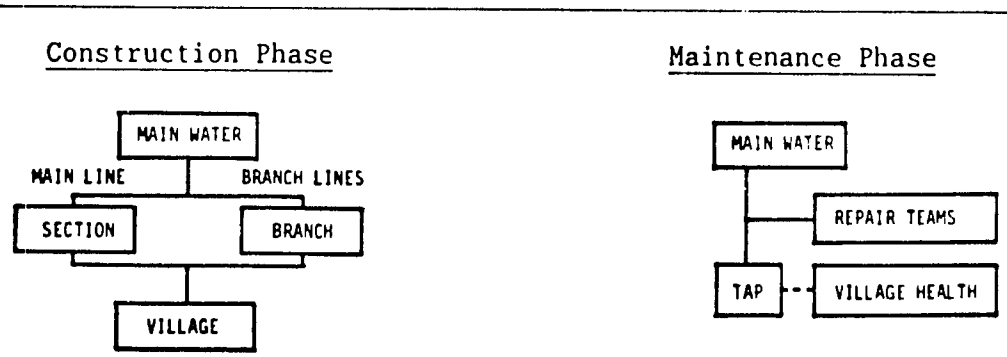


**Figure 8. Piped Water Committee**

Table 14

Health Education Training Sessions Records From 1983 to 1986

| Title of Course | Place | No. of Participants | Duration |
|---|---|---|---|
| Training of Trainers | Msamba (Lilongwe) | 12 | 5th to 8th April 1983 |
| Training for HSA. W/S | Ntcheu | 27 | 18th April to 6th May 1983 |
| Training for HSA. W/S | Mangochi | | 17th May to 3rd June 1983 |
| HAS Workshop H.Ed. W/S | Namitambo | 25 | 6th to 18th June 1984 |
| HSA Workshop H.Ed. W/S | Karonga | 25 | 25th to 30th July 1984 |
| Local Leaders Health Courses | Rumphi (Ng'onga) | 120 | 20th to 30th June 1985 |
| Local Leaders Health Courses | Zomba - Chingale | 100 | 28th to 30th July 1985 |
| Local Leaders Health Courses | Zomba - Domasi | 100 | 26th to 28th September 1985 |
| HSA and HAS H. Ed. Course | Mangochi | 30 | 24th to 28th June 1985 |
| Supervisors meeting | Zomba | 10 | 20th to 25th September 1985 |
| Supervisors meeting | Karonga | 8 | 17th to 20th August 1985 |
| Hygiene Education Course for Local Leaders | Enukweni (Mzimba) | 30 | 14th to 16th October 1985 |
| Water Laboratory course (H. Insp) | Lilongwe Water Lab. | 3 | 6th to 10 May 1985 |
| HSA Seminar on VIP Construction | Mchinji Hospital | 15 | 26th to 30th December 1985 |
| Training of Trainers by WASH | Chilema - Zomba | 22 | 6th to 25th January 1986 |
| HSA H. Ed. Workshop | Thuchila - Mulanje | 25 | 15th to 21st March 1986 |
| Training of Trainers preparation week | Lilongwe | 12 | 9th to 13th March 1986 |
| HSA H. Ed. Workshop | Dowa Red Cross | 30 | 7th to 11 April 1986 |

Nearly all of the committees are made up of ten members who are elected with a chairman, vice-chairman, secretary and treasurer. As shown in Table 22 (Chapter 8), women usually are the majority on tap committees but men overwhelmingly dominate the construction and maintenance committees and pipe repair teams. No comparable data on sex was identified for construction committees.

The success of individual subprojects depends upon the authority of the committees. This authority is derived from the local leadership, that is, the village chief and Malawi Congress Party leaders, although none of these committees have any legal status. Some maintenance committees, however, have become subcommittees within Area Action Groups, which are part of the District Development Committee structure.

During the construction phase, each commmittee has distinct responsibilities:

Main Water Committee is responsible for the overall management of the self-help program. The initial work program is organized by this committee and is also responsible for setting up the main line digging program.

Section Committees in large projects are elected from villages located along various sections of the pipe which comes off the main line. The committee draws up a daily trench digging program with members supervising the trench digging on a rotational basis.

Branch Committees are responsible for organizing labor on branch lines once the digging and backfilling on the main line and section lines are completed.

Village Committees are responsible for supervising the village labor on the appointed day of work and ensuring that village attendance is maintained. They are also responsible for selecting the sites for all standpipes in the village.

Once the project is completed the committee structure for maintaining the system, as shown in Figure 8, is introduced. In most projects the main water committee elected for the construction work is retained to supervise the maintenance. A few projects have elected a new main water committee for maintenance.

During the maintenance phase, the committee responsibilities are:

Main Water Committee supervises repair teams, tap committees, and caretakers; raises funds through village headmen; checks the pipeline and reports any problems to RWS staff; reports to Area Action Groups; submits requests for additional taps; organizes self-help labor whenever it is required; and settles disputes between tap committees and repair teams.

Repair Teams are a technical arm of the main water committee in most large projects. They carry out basic repairs on broken pipes except AC pipes, which are handled by water project staff. The chairman is responsible for tools, equipment, and spare parts required for maintenance work.

Tap Committees are responsible for operation, care, and maintenance of a single tap. The committee organizes periodic cleaning of the tap site and soakaway pit and raises funds from users for either replacement of a wornout tap or repair of the apron.

Village Health Committees were not an integral part of the community maintenance structure in the past. They were organized by MOH field workers to educate villagers and promote improved health practices in the entire village. VHCs are now becoming increasingly involved with water supply and sanitation issues, and there is some overlap with tap committees in responsibilities for monitoring cleanliness around taps.

The mid-term evaluation concluded that community support for constructing and maintaining piped water systems was excellent. The evaluation team believes that this conclusion also applies to the final evaluation. Active community involvement has continued to foster a sense of ownership of the systems by the people and not by the government. The strength of the community committee structure for maintaining the systems does vary, but the reliability of water flowing from the tap remains high.

### 5.5.2 Institutional Linkages of Committees

One of the strengths of rural development in Malawi is the number and effectiveness of the committees operating at the village and area level. In addition to the main water committees, there are village development committees (VDC), village health committees (VHC), and temporary subcommittees of the VDC which are organized for particular short-term community projects. The distinction was made in Section 5.5.1 between main water construction committees and main water maintenance committees, the former being temporary (two to four years) and responsible for planning and constructing the system, and the latter being permanent and responsible for continuing maintenance of the system.

Development planning at the national level is carried out by the National Planning Commission which is chaired by the president. The next administrative level is at the district and is called the District Development Committee (DDC). Each district is made up of a number of areas under the responsibility of Area Action Groups (AAG). The AAG is chaired by the traditional authority (TA) or chief of the area and is responsible for approving and supervising all self-help activities. The AAG has the legal authority to raise funds. The Malawi Congress Party is considered the best-organized institution in the country and has played a significant role in water projects, especially in mobilizing people for self-help activities.

The main water committee has been somewhat independent of the AAG in many projects. The VDC is chaired by the village chief, is responsible for village-led self-help activities, and has the power to enforce rules and collect money. The VHC is stimulated and organized by MOH field staff. The VHC has no power, but can rely on the VDC for support, and can interact with the tap committee. Figure 9, which follows, illustrates the interaction of the various local institutions with water project committees.

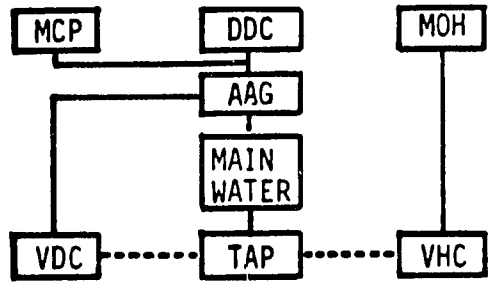


Figure 9. Interaction of Local Institutions.

The mid-term evaluation did not directly address the institutional linkages of committees. The scope of work for the final evaluation included three questions related to the relationship of the water committees to other institutions.

The first question: Are independent water committees the best way to ensure implementation and maintenance? The evaluation team found every indication that relatively independent water construction committees are effective. A recent report prepared for USAID on institutions involved in rural water maintenance (Msukwa, 1986) concluded that the greater the involvement of the AAG in maintenance of water projects, the more efficient are the water organizations. The report recommends the promotion of structural links between the AAGs and the water organizations, but it qualifies this by adding that it is important that a separate, semi-independent water committee is necessary because the AAG and VDC have enough work already and the water project needs the full attention of one committee.

Msukwa also pointed out that in some cases where maintenance committees had operated for more than five years there was a decrease in the energy and effectiveness of the committee. To alleviate this potential problem, he recommended that new maintenance committees be elected at the completion of system construction and that members serve for fixed terms of two to four years.

The second question: Are water committees perceived by villagers as their own or as creations of the government? There have been more than 20 years of operation of village self-help committees in rural Malaŵi. The committee tradition is well established and accepted as the way things are structured in villages. There is every reason to believe that villagers today feel that the committees are theirs, even though 20 years ago the government may have promoted them. The more important question is whether the villagers believe the water systems are theirs and they are responsible for maintaining them. To this question, the answer is clearly yes, the villagers do feel that they own them.

The third question: Is there a pattern of facilitation due to committee members having positions in other local institutions? The Msukwa report found that more than 77 percent of the maintenance committee members are also

members of other committees, the greatest proportion (31.8 percent) being Malawi Congress Party (MCP) officials. Repair team members belonging to other institutions are 52 percent, while 35 percent of tap committee members hold positions in other institutions. There appears to be significant participation of water committee members in numerous other local institutions.

The Msukwa report contains substantial current information regarding institutional linkages of committees involved in self-help projects in the Msukwa report. It is recommended that the MOH and MOWS review this report and its recommendations.

## 5.6 Information Systems

Data collection, analysis, and utilization is institutionalized to varying degrees by the MOWS and MOH. The Project Paper envisioned this activity being the responsibility of a new Training and Research Unit of the RWS. As this unit was never established, the information responsibilities in the MOWS were assumed initially (1983-1985) by an evaluation officer and afterward, when the post became vacant, by a technical officer. In the MOH, the Principal Health Coordinator is responsible for the information system, which is intended to support both project monitoring and evaluation. Both the MOWS and the MOH systems are expected to be sufficiently simple and relevant to ensure immediate feedback and provide adequate baseline data to evaluate longer term impacts and trends.

### 5.6.1 Ministry of Works and Supplies

Data collection in support of construction activities of the RWS is well institutionalized. Monthly reports are sent to the RWS headquarters in Lilongwe for review by the principal engineer with responsibility for the subproject. The key element of the report is a Sketch Layout Plan which indicates progress on subcomponents of construction activities. Monitoring and control of construction activities are facilitated by the use of this system. These reports provide a source of information which can be useful in project planning as well as in the identification of common construction problems. They also allow for an objective assessment of staff performance over time.

Monitoring of completed projects is the other focus of information system activities in the MOWS. This function involves a broad range of activities and, thus, a more detailed data collection effort. The system in the south is somewhat more advanced due to the longer presence of rural water supply projects in the area. At the time of the mid-term evaluation, there was only data collection in the Southern Region. Since then, monitoring activities have been initiated at projects completed in the north.

The evaluation team finds both ministries using their information systems well. Procedures for data collection, analysis, and subsequent utilization are especially well developed in the RWS. Because of a shortage of HESP staff, however, the MOH has some problems in processing all of its field data.

Given the staff constraints in the RWS and in the MOWS as a whole, the information system is performing well although it is limited primarily to monitoring and control. While the technical capacity exists to implement more complex analysis of data, the RWS is almost fully occupied in direct management of current activities. Any manpower planning effort undertaken by the MOWS will need to review the situation.

Computerization of routine technical design, and information storage and retrieval could be of great assistance to the MOWS. The Water Department would like to obtain an IBM/PC AT computer to carry out pipeline network designs in both the urban and rural water supply areas. In addition, the Central Water Laboratory of the Water Department would like an IBM/PC XT computer for data analysis and reporting of water quality data.

### 5.6.2 Ministry of Health

The HESP information system was developed by the Principal Health Coordinator to support the HESP component. The evaluation team found that data gathering activities of field-level ministry staff were performed adequately but that data analysis and utilization needed improvement. All data are routed to the PHC for processing, analysis, and storage. As noted elsewhere, the successful implementation of HESP activities has overburdened the PHC and his capacity to effectively handle all information processing responsibilities. Consequently, the evaluation team believes there is need for another senior health officer to strengthen the HESP component. MOH acceptance of this recommendation would significantly increase the capability of HESP to better use its information system.

Priorities for staff effort exist in two areas: data validation. and data analysis. A need exists to review field data forms to insure consistency of data reporting. Validation of the data supplied by the HAs and HSAs would provide feedback to staff on the importance of accurate data collection and would provide incentive to headquarters staff to make greater use of higher quality data. For data analysis, the priority need is for compilation of the data by the PHC. A wealth of existing data is waiting for more sophisticated analyses. This information could contribute to training efforts, targeting of HESP activities, and program evaluation. In summary, the information system of HESP is working under considerable constraints and requires additional staff resources to use its full potential for the rural water program.

## 5.7 Monitoring and Evaluation

### 5.7.1 Monitoring Activities

Extensive internal monitoring of field activities is conducted within both the MOWS and the MOH. The key role in the water systems is that of the monitoring assistant who follows a preplanned annual program of field visits, inspections, and the preparation of reports for regional and headquarters levels.

At the start of each calendar year, project supervisors prepare a month-by-month maintenance program for each monitoring assistant. This program is then

broken down into biweekly work programs showing various types of inspections, biweekly maintenance supervision, and other activities for each day of the period. In carrying out their assigned tasks, monitoring assistants usually inspect all taps within their area at least twice annually and intakes approximately four times annually. During these inspections, they receive reports on pipe breakages from repair teams. The monitoring assistants, in turn, are required to fill out a series of reports for submission to their project supervisor, including a weekly work report as well as separate inspection reports on taps, river/gully crossings, and pipelines, plus additional reports on AC and PVC pipe breakages, and the consumption of materials inventory. Project supervisors use this information to prepare a six-month monitoring performance report for headquarters.

In general, the foregoing monitoring system works well at the project level. Information is continually being gathered by repair teams, monitoring assistants, and project supervisors, all of whom have responsibility for undertaking immediate corrective action at the first sign of trouble in the water system. The monitoring system works less well at the headquarters level of the RWS where, because of the current shortage of engineers, reports from the field are not always reviewed promptly. Because of the effective monitoring-maintenance interaction at the field level, however, there rarely is need for headquarters intervention into routine maintenance activities.

A similar series of field monitoring reports are generated in the HESP program in the sanitation and hygiene area by health assistants and health surveillance assistants. Unfortunately, the feedback to maintenance and other corrective action in the field seems less effective than in the water area because of a shortage of funds for maintenance activities. The problem of information analysis becomes acute at the headquarters level where the principal health coordinator has neither technical backstopping nor assistants to help with the review of field reports.

### 5.7.2 Evaluation Analyses

Under USAID financing, evaluation has been made an integral part of the Malawi rural piped water program. Starting with the Project Paper (USAID, 1980), which called for mid-term and final evaluations plus the establishment of a training and research unit to carry out, among other things, evaluation studies, such studies have been performed on all major aspects of the project. While the establishment of a formal training and research unit was deleted from the project objectives as a result of the recommendations of the mid-term evaluation (Warner et al., 1983), the requirement for a comprehensive evaluation program has remained. In February 1985, an outline of an overall evaluation program for the remainder of the project was drawn up for USAID (Briscoe, 1985). This outline has served in lieu of the formal evaluation plan called for by the mid-term assessment.

The RWS has carried out a number of internal evaluation studies during the course of the project. During the initial years, engineering research into intake design and water treatment was conducted at the Zomba training center. Field investigations into pipe breakages, water use, and per capita consumption were also carried out during this period. From 1983 to 1985, the RWS had the services of a Peace Corps Volunteer who carried out field studies on pipe

breakages, water demands, and washing slabs (Easton, 1985a: 1985b; 1985c; 1985d; 1985e).

By far, however, the bulk of project-related evaluations have been conducted outside of the RWS. Two financial reviews have occurred; the first, by the United States General Accounting Office in 1984, did not use project funds, although the second, by Price Waterhouse in 1984, was financed from the project budget.

A number of social science studies have been commissioned at the Centre for Social Research in Zomba. These studies have evaluated water use, water consumption, and the institutional aspects of maintenance (Msukwa and Kandoole, 1981; Ettema, 1983; Msukwa, 1986). Project funds have also been used to support field investigations of water quality (Lewis, 1985). In addition, USAID has used project funds to commission a University of North Carolina study of health impacts, especially diarrhea, arising from the project (Young and Briscoe, 1986).

These studies and evaluation activities have provided a continuing review of project progress and have provided opportunities for modification in project management, financial administration, and technical design. The evaluation team finds that evaluation activities have served USAID and the project well and recommends that future water and sanitation programs of this nature have evaluation activities built into project design.

## 5.8 Research Activities

### 5.8.1 Engineering Research

During the first three years of the USAID project, applied engineering research activities were carried out under the supervision of the senior water engineer (SWE) in Zomba. These activities were stimulated by problems (such as pipe breakages, water treatment and intake design) faced by the Malawi rural piped water program. The research was well conducted and relevant, feeding directly back into project design and operational procedures.

Over the past two and a half years, the position of SWE has been vacant, and the research activities have stopped. The need for further engineering research (for instance, on pretreatment of turbid waters) is great. It is recommended that the Department of Water make every effort to recruit an engineer capable of designing and conducting this research, or assign current staff members to this task. Funding agencies considering financing the program would be advised to ensure that the engineering position is explicitly defined and filled as part of such a project.

### 5.8.2 Social and Health Research

One of the great strengths of the rural piped water program has been a consistent search for improvements not only in the engineering but also in the social and institutional areas. As part of this search, there have been insightful prior analyses into the social and institutional structure of the program (Msukwa and Chirwa, 1980, Msukwa and Kandoole, 1981).

Because of the importance of maintenance issues to the future of the program, and because of the importance of strong government and community institutions to the functioning of a maintenance system, the Department of Water commissioned, with project funds, the Centre for Social Research to carry out a study of the role of institutions in maintaining rural piped water schemes (Msukwa, 1986). The findings of this study are discussed elsewhere in this report. It is appropriate here to strongly endorse the continued commissioning of such work as part of an overall approach to improving the design, construction, and maintenance of the systems.

For the GOM and USAID, the improvement of health of the villagers served by the project is an important objective. Two research studies designed to assess health impacts have been carried out over the life of the project. The first is a prospective study of the USAID-financed program in Zomba West, carried out (with independent funding) by a team of Swedish researchers (Linskog and Linskog, 1985). Throughout this evaluation reference is made to the useful information which has been generated by this research project. Because of the long time required for the design, conduct, and analysis of such prospective studies (the Zomba West study started in 1981 and has not yet finished) and because of the interest of the GOM and USAID in assessing the impacts of the combined water and sanitation program before the end of the project, a rapid epidemiologic study of the effect of the improved water supply and sanitation on diarrhea in Zomba East was commissioned. This study was executed by a team from the University of North Carolina (Young and Briscoe, 1986), in conjunction with the Ministry of Health and Department of Water. The final results of the study (discussed in detail in Chapter 8) provide several policy-relevant insights into the joint effect of water supply and hygiene practices on diarrheal disease.

The evaluation team considers the spirit of self-evaluation and inquiry which gave rise to these engineering, social, and health research projects to be one of the great strengths of the Malaŵi Self-help Rural Water Supply Project and the HESP component. It is recommended that these activities continue to be encouraged, and that provision for a modest level of funding for such applied research projects be included in future projects.

## 5.9 Interministerial Coordination

### 5.9.1 Role of the Principal Health Coordinator

One of the major tasks of the Principal Health Coordinator has been to develop strong links between the HESP activities of the MOH and the water projects of the MOWS. This coordination is functioning effectively at the departmental level and is being stimulated successfully at the field level. A good measure of success of this activity is the commitment on behalf of decision-makers in both the Department of Water and Ministry of Health to continue and strengthen these links. Externally funded projects initiated since the start of the USAID program (including groundwater anbd HESP-type projects of UNICEF and DANIDA) have been designed with this collaboration as a central element. Little doubt exists that this will become a central feature of the water supply and sanitation sector in Malaŵi.

### 5.9.2 Role of Community Organizations and Government Field Staff

The interactions between the various village committees involved with piped water schemes and the respective government ministries dealing with water and health are dynamic and complex. The high degree of variability in the interactions from village to village and project to project makes it difficult to assess. The community organizations including project, tap, and village health committees and repair teams are described in Section 5.5.1. The MOWS staff, including monitoring supervisers and monitoring assistants, and the MOH staff, including district health inspectors (DHIs), health assistants (HAs), and health surveillance assistants (HSAs) are described in Sections 5.4.1 and 5.4.3, respectively.

Figure 10 below depicts the interactions between committee and government field staff:

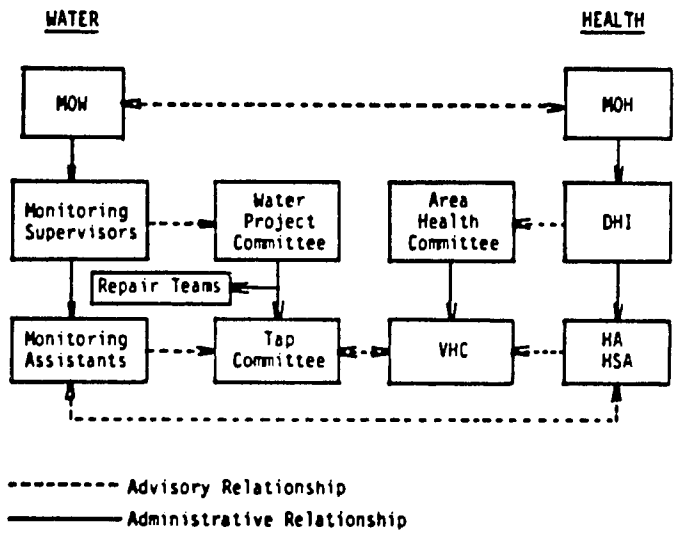


Figure 10. Committee and Governmental Field Staff Relationships.

The mid-term evaluation concluded that prior to the USAID project, little attention was paid to intersectoral coordination at the community level. After two and a half years of the project, it was found that village tap and village health committee members were aware of each other's responsibilities and were beginning to collaborate. In addition, MOWS and MOH field staff were beginning to exchange work programs and had some limited contact with each other.

The evaluation found that considerable progress toward improved communication and collaboration has been made between community organizations and government

field staff since the mid-term evaluation. The HESP program has mobilized target villages, and field staff in those areas periodically share plans and schedules. In some areas, tap committees and village health committees have united into a single committee. In other areas, however, some confusion exists between the responsibilities of these two committees.

Msukwa (1986) reported that constant contact between HSAs and MAs stimulated the promotion of health activities. In the Champhira North scheme, the monitoring assistant often travels with the health assistant for joint monitoring and hygiene education promotion. Msukwa also found that the strengths and weaknesses of a community organization in a project reflects the ability of the staff to build and strengthen the organization.

One of the more significant events of interministerial coordination was a two-week joint training of trainers workshop for MOWS and MOH staff held in Chilema in January 1986. Ten public health inspectors and ten water supervisors worked on improving their training skills and spent one and one half days discussing ways to improve future collaboration between the HESP program and the RWS staff. The participants were unanimous in their endorsement of more field collaboration and developed specific recommendations on ways to work more effectively together.

In summary, the interministerial coordination and village committee communications have grown significantly. It is recommended that MOWS and MOH field staff continue with this cooperative spirit and seek to develop additional training programs and field activities at every stage of development of the piped water project.

### 5.9.3 National Action Committee for the Water Decade

As part of the International Drinking Water Supply and Sanitation Decade (1981-1990), the United Nations called upon governments to establish National Action Committees (NAC) composed of representatives from every appropriate ministry to develop a plan of action for achieving the goals of safe water and adequate sanitation for all.

The 1983 mid-term evaluation of the USAID-financed program concluded that Malawi had made a commitment to the Decade, had developed organizations to fulfill this commitment, but had not perceived the need to make organizational changes to fit the general Decade mold.

Since 1983, Volume 1 of the National Water Resources Master Plan has been produced (UNDP/Malawi, 1983). When finally completed in December 1986, this UNDP-sponsored activity is expected to provide the GOM with an overall countrywide plan for developing water resources. In addition, a National Sanitation Plan was prepared by WHO in 1982. Two years later, the Department of Lands, Valuation and Water was taken over by the MOWS and one staff member was assigned the responsibility for coordinating Decade information. The National Action Committee, which was established at the beginning of the Decade, has not been convened since 1983.

In summary, although the NAC has been relatively inactive, the GOM has prepared separate planning documents for water and sanitation. Some degree of

collaboration exists among the various ministries involved in the sector, but there does not appear to be a perceived need within the GOM to undertake formal Decade-related activities.

## 5.10 Summary of Recommendations

**Conclusions and Recommendations Concerning the Ministry of Health:**

The main conclusion of this assessment of the USAID-funded HESP program is that it has been an outstanding success. Not only have project goals been exceeded, but the quality of the program and the results have helped to institutionalize the HESP idea within the MOH. Moreover, plans have been made to extend HESP activities to other areas. The addition of the HESP component to the well-established rural piped water program can be counted as a major contribution by USAID to the development of environmental health in rural Malawi.

Accordingly, the evaluation team endorses the policy of the MOH to strengthen and extend HESP activities. The following are a few specific recommendations for consideration by the MOH and funding agencies who may become involved in the HESP program:

1. The Ministry of Health policy to strengthen VHCs by encouraging active collaboration with women's groups should be supported.

2. A need exists to develop appropriate low-cost solutions to the problem of collapsing latrines in rural areas. It is recommended that HESP and the Department of Water explore the possibility of technical assistance from the World Bank low-cost sanitation expert who is resident in Lilongwe. This technical assistance should focus specifically on solutions to the problem of collapse of latrines built on a self-help basis.

3. Consideration should be given to providing project funds to HESP for the construction of more washing slabs and possibly low-cost latrine slabs (of the type developed by the Low-Cost Sanitation Project).

4. A measure of the success of the HESP activities has been the rapid increase in requests for HESP services. As this expansion occurs, there is a possibility of the program being spread too thin. It is, therefore, recommended that immediate consideration be given to supplementing the HESP headquarters staff with a second person of the rank of senior health inspector or higher.

5. A related problem is that of the coverage of HSAs in the field. The area covered by one HSA (approximately ten villages) is larger than can be adequately handled by a single individual, given his multiple responsibilities and substantial demands for HESP activities. Recognizing that the problem of shortage of revenue for the recurrent budget has been a major factor limiting the expansion of health services (GOM, WHO, UNICEF, 1984), it is

unlikely that this will be achieved by an increase in the number of established posts. In view of the positive results of the HESP program, it is recommended that future externally funded projects pay for nonestablished HSAs from project funds. The Principal Health Coordinator has estimated that another 56 HSAs need to be deployed in the areas already covered by HESP, thereby implying that the density of HSAs in HESP areas needs to be increased by approximately 50 percent.

Conclusions and recommendations concerning the Ministry of Works and Supplies:

1. The MOWS needs a program of project activities following the completion of the USAID-financed project. It is recommended that a plan should be prepared for developing new schemes in the remaining catchments having a high potential for piped water projects.

2. A serious shortage of engineering staff exists in the RWS, and this situation grows more acute as the number of rural systems continues to expand. The MOWS and the MOH should carry out a joint manpower needs assessment of the piped water program.

3. The report of the Centre for Social Research (Msukwa, 1986) contains a number of useful recommendations regarding committee structure and operation for maintenance of the rural piped projects. It is recommended that the MOWS carefully review this report for the purpose of improving maintenance operations.

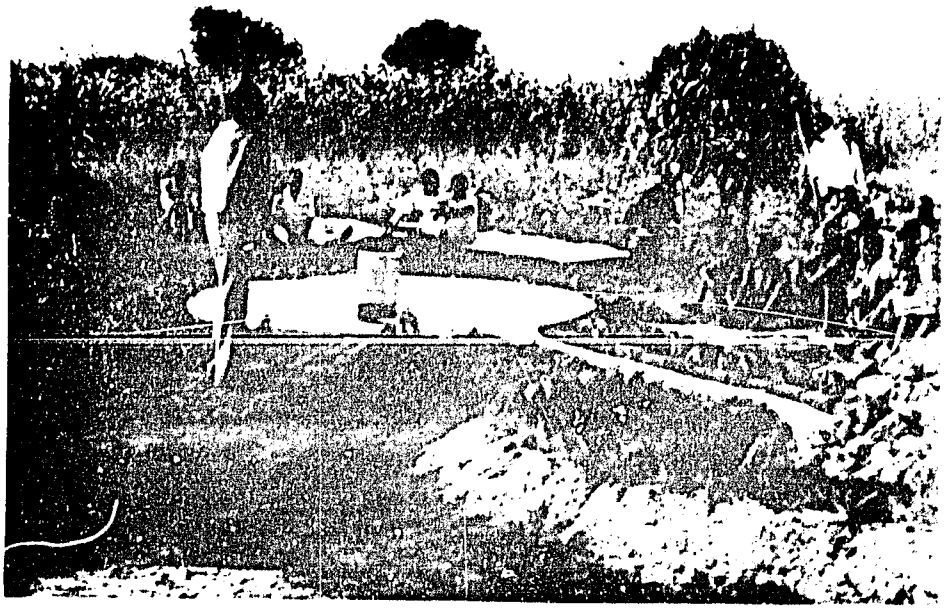

Photo 12 (right).
Tap Opening
Ceremony.

Photo 13 (left).
Field Assistant installing
faucet at opening ceremony.

# Chapter 6

## PROJECT OPERATION: STATUS OF PROJECT SCHEMES

### 6.1 Construction Status

#### 6.1.1 System Status

Prior to the start of the current USAID-financed project in 1981, the GOM had implemented 34 gravity-fed water schemes with the assistance of a variety of donors, including UNICEF, OXFAM, Christian Service Committee of the Churches of Malawi, DANIDA, ICCO, CEBAMO, CIDA, and USAID. The last of these projects was completed in 1983. They contain a total of 3,737 kilometers of pipelines and 4,951 taps and serve a design population of 753,000. The total materials cost amounted to MK 4,458,400.

Construction of USAID-financed schemes began in 1981. By the time of the final evaluation in May 1986, nine schemes had been completed, eight were under construction, and one (Mulanje Southwest) had not yet begun. Approximately 86 percent of the budget had been expended. Of these 18 schemes, 17 were new subprojects, while one (augmentation scheme) consisted of replacement of AC pipes with PVC pipes in the older Mulanje schemes. An estimated 320,000 people were being supplied with water in the schemes by March 1986. This amount represents 77 percent of the ultimate design population of 422,000. At completion, these schemes will have 2,673 taps and 2,060 kilometers of pipelines. Tables 2, 3, and 4 (in section 4.1.1) show the construction status of the 18 USAID schemes just prior to the final evaluation.

The extension of the project termination date from 5 June 1986 to 31 December 1988 has allowed a corresponding extension of the construction schedules of the incompleted subprojects. As shown in Figure 4 (in Section 4.1.1), eight of the nine incompleted schemes are scheduled to be finished in 1987. The ninth scheme, Mulanje Southwest, is just getting under way and will be completed in mid-1988.

#### 6.1.2 System Selection

The Project Paper proposed 23 potential schemes, or subprojects, for implementation under USAID financing. This list was intended to be representative of the types of project activities that could be undertaken over the life of the project. It was not intended to be a definitive list because few schemes had been subjected to detailed field investigations. During project implementation, further investigations by the RWS led to the acceptance of 10 of the original 23 schemes, the rejection or deferral of 13 schemes, and the identification and construction of 8 new schemes. Table 15 compares the actual with the proposed subproject implementation program.

Two major changes occurred in the selection and implementation of subprojects. The first involved the deferral and eventual deletion from the subproject list of the Zomba South scheme, which has the potential of serving 120,000 people in Zomba District. Because of problems and delays related to the water source, the need to construct a second dam and reservoir, and

Table 15

Comparison of Actual with Proposed
Subproject Implementation Program

| Project Paper Proposals | | | RWS Current Program | | |
|---|---|---|---|---|---|
| Subproject Name | District | Design Population | Sub-Project Name | District | Design Population |
| Nanyangu | Ntcheu | 15,000 | Livonde | Machinga | 23,000 |
| Livonde | Machinga | 6,000 | Kasanje/Nanjangu | Ntcheu | 54,000 |
| Chimaliro North | Mzimba | 10,000 | Iponga | Karonga | 5,600 |
| Chimaliro South | Mzimba | 15,000 | Chitipa & Extensions | Chitipa | 46,000 |
| Zomba South | Zomba | 85,000 | Mwanza | Chikwawa | 40,000 |
| Kasinje | Nitcheu | 10,000 | Chimaliro (Champhira N) | Mzimba | 24,000 |
| Iponga | Karonga | 3,000 | Zumulu | Machinga | 23,500 |
| Misuku | Chitipa | 1,000 | Mwansambo/Kasakula | Ntchisi | 25,000 |
| Nyungwe | Karonga | 4,000 | Misuku | Chitipa | 3,700 |
| Tukomba | Nkhatabay | 2,000 | Mirala | Machinga | 13,000 |
| Mlovi | Nkhatabay | 2,000 | Makwawa | Zomba | 16,000 |
| Lufutazi | Nkhatabay | 2,000 | Chimaliro S (Champhira S) | Mzimba | 32,000 |
| Usisya | Nkhatabay | 8,000 | Zomba West | Zomba | 60,000 |
| Ruarwe | Nkhatabay | 1,000 | Msaka | Mzimba | 3,000 |
| Msaka | Mzimba | 2,000 | Mwansambo/Mwadzama | Mtchisi | 18.000 |
| Ifumbo | Chitipa | 1,500 | Augmentation | Mulanje | N/A |
| Mlowe | Rumphi | 2,000 | Lifutazi | Nkhata Bay | 11,000 |
| Dwambazi | Nkhatabay/ Nkhotakota | 2,000 | Malanje Southwest | Mulanje | 24,000 |
| Tsavuche | Dedze | 2,000 | | | |
| Chiradzulu | Chiradzulu | 8,000 | | | |
| Sankhulani | Nsanje | 10,000 | | TOTAL | 421,800 |
| Mbonechela | Machinga | 8,000 | | | |
| Maona | Thyolo | 2,000 | | | |
| | TOTAL | 201,500 | | | |

questions regarding non-USAID donor funding of the dam, it was decided to exclude Zomba South from the list of USAID schemes.

The second major change was the addition of augmentation activities in the Mulanje area. This consisted of replacing older AC pipes, which were experiencing increasing maintenance problems due to aggressive (high pH) waters and unstable black cotton soils, with new PVC pipes. Prior to the USAID project, most main lines were constructed with AC pipes because of its lower costs and ready availability. In the Mulanje area, however, the unstable soils caused numerous pipe breakages which tended to increase over time as the pipes progressively deteriorated from the aggressive waters. In 1983, the decision was made to allocate project funds to the replacement of the main lines, generally pipe diameters ranging between 100 mm and 225 mm, in the Sombani, Phalombe, and Namitambo schemes. PVC pipes, which by then were being manufactured in Lilongwe and were the standard in all USAID schemes, were used for the replacement. These augmentation projects were implemented using the same committees and procedures that there used in the original schemes, that is, project committees were responsible for organizing the work, villagers provided the self-help labor, and the RWS supplied the materials and overall technical supervision.

The evaluation team considers the changes which occurred in the original subproject list and the ultimate selections of new schemes to have been done in a reasonable and technically sound manner. Although the total number of proposed schemes dropped from 23 to 18, the design population for the overall project has risen from 202,000 to 422,000.* The original population design figure was based upon the 1977 census population in the 23 proposed schemes as modified by either a 2.6 percent annual growth rate or an estimate of the "ultimate" population carrying capacity of the land within the subproject areas. The new population design figure is based upon the estimated number of people in the 18 actual schemes in 1997 (the 1977 population compounded at a 2.6% annual growth rate over 20 years). It is estimated that approximately 320,000 people are currently (as of 31 March 1986) receiving water from the project. This total does not include any additional populations served in the augmentation activities in the Mulanje area.

### 6.1.3 Construction Schedule

The Project Grant Agreement, which was signed on 28 August 1980, by USAID and the GOM, specified the Project Assistance Completion Date (PACD) to be December 1985, with the terminal date for disbursements to be nine months later. In June 1985, USAID and the GOM agreed to extend the project to 31 December 1988 with no increase in project funds. The primary purpose of this extension was to ensure that all grant funds were fully expended on project activities. There were several valid reasons for extending the project.

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*In the mid-term evaluation, the overall design population was given as 463,000. This figure included the Zomba West scheme, which has since been deleted from the project list.

First, the project was slow in getting started. Actual construction of water systems did not begin until April 1981, and the position of Principal Health Coordinator for the HESP component was not filled until July 1982. Second, exchange rate fluctuations leading to long-term devaluation of the Malawian Kwacha resulted in greater buying power for U.S. dollar grant funds. For example, one U.S. dollar was worth MK 0.80 in July 1980, MK 1.04 in August 1983, and MK 1.75 in May 1986. As a result, actual expenditures for salaries, supplies, and commodities were less than originally projected, thereby allowing the GOM, with USAID approval, to take on additional project activities which had not been anticipated in either the Project Paper or Grant Agreement.

Third, some delays occurred in the initiation of several subprojects and in the completion of others. The Zomba South scheme was initially delayed because of uncertainties regarding the construction of a dam, and then, because these uncertainties could not be resolved, was dropped from the list of project schemes in 1986. Four subprojects experienced delays during construction:

- Chitipa - The area was essentially uninhabited at the time of design, and population immigration began during construction. There were insufficient numbers of people for self-help construction. Many extensions were added to the design during construction.

- Mwanza - A long (22 km) and difficult upper main line required contract labor for construction. A 2 km washout of the upper main in January 1986 caused further delays.

- Mirala - A breakdown of the cement factory in Blantyre in late 1985 caused a four-month delay in field operations.

- Makwawa - A cement shortage caused some delays. Others were the result of difficulties in organizing effective community participation in suburban areas included within the scheme.

In general, rural projects which are based upon self-help labor inputs are more difficult to hold to a fixed construction schedule than are those based upon contract labor. Moreover, the RWS has had a policy of implementing schemes only as fast as the enthusiasm and interest of the project communities allowed. Occasionally, such schemes are completed ahead of schedule. The first stage of Lifutazi, for example, was finished six months early because of enthusiastic community participation. Figure 4 in Chapter 4 illustrates the actual and anticipated remaining construction schedules of all subprojects.

Overall, the evaluation team finds the pace of construction and adherence to schedules acceptable within the context of the project. No undue delays have occurred, and all construction, with the exception of Mulanje Southwest, should be completed at least one year before the revised project completion date of December 1988.

## 6.2 Operational Status

### 6.2.1 Water Quantity

Through 1982, rural water schemes were designed to supply 27 lcd, but since 1983, a design rate of 36 lcd has been used. These rates represent the capacity of a system to provide water to its design population. If the actual population is less than the design figure, or if average per capita consumption of water is less than the design rate, a system will operate at less than its rated capacity. Metering studies can be used to determine the amounts of water supplied by a system. Meters are usually placed at the outlets of main storage tanks to measure overall line deliveries and sometimes at individual water taps to measure specific village deliveries. Water delivery, or production, however, is not the same as water consumption. The latter consists only of water actually carried away from standpipes for use at the home, while the former includes both water consumption at the home as well as water used at the tap and water lost through leaks and broken pipes.

Metering activities in the RWS began on a limited basis in 1981 and have continued to the present, but they remain in the domain of short-term investigations of specific schemes rather than universal monitoring of all schemes. None of the studies completed to date includes any metering data on schemes in the USAID-financed project, although such information reportedly will be available in the near future.

Initial metering investigations were carried out by the RWS in the Nalipili area of the Mulanje West scheme over the period January 1981 to June 1982. This study showed water production to average 10.3 lcd for the area (Young and Briscoe, 1986). An expanded program of metering was conducted by the RWS in the Mulanje West scheme from November 1982 to May 1983. For a subarea containing 254 taps, the metering indicated average water flow to be 188.7 Imp. gal/min (14.3 lit/sec) compared to design flow of 254 Imp. gal/min (19.2 lit/sec), or 73 percent of design capacity (van Schaik, 1983a). For the entire Mulanje West scheme which contained approximately 500 taps and 80,000 people, total metered flow into the system over the period January through May 1982 averaged 253 Imp. gal/min (19.2 lit/sec). This was 84 percent of the design capacity of 300 Imp. gal/min (22.7 lit/sec) and represents an average delivery rate of 18.6 lcd (van Schaik, 1983b).

The relatively low per capita rates of water production found in these early studies were also found in more recent RWS investigations. A metering study of the Lifani scheme over the period July through September 1984 showed water production to be 55 Imp. gal/min (4.2 lit/sec), or 69 percent of the design capacity of 79.6 Imp. gal/min (6.0 lit/sec). Although overall per capita production was 20 lcd, individual branch lines in Lifani had water deliveries ranging from 13.1 lcd to 34.5 lcd (Easton, 1985c).

The age of a scheme does not seem to have any direct correlation with overall water production. In Chingale, the first rural piped water scheme in Malawi, production was metered in May 1985 at 17.0 lcd (Young and Briscoe, 1986).

The results of the various metering studies conducted to date, therefore, show that water deliveries are within design limits and that all systems have some

unused capacity remaining. This reserve, however, will decrease as populations grow and per capita consumption rates increase. The mid-term evaluation recommended routine metering of all USAID-financed schemes in order to monitor current operations and to plan for future extensions. It called for, at a minimum, the installation of a single master meter on all schemes and the reading of the meter on a weekly basis. These recommendations remain valid and should be seriously considered.

### 6.2.2 Water Quality

Water quality in the Malawi rural piped water program is maintained by siting intakes in mountain streams within protected forests above areas of human habitation. No water treatment, other than intake screening and a simple sedimentation tank near the intake, is included in system design. Recently, slow sand filters have been constructed at the Domboli scheme (non-USAID) and the Mwanza scheme (USAID). Additional slow sand filters may be constructed in future projects if water quality is poor and if the results of the current filters are satisfactory.

Water quality testing in Malawi has improved greatly as a result of the USAID-financed project. The Central Water Laboratory (CWL) in Lilongwe was provided with $99,000 of project funds to procure laboratory equipment for water quality testing. Initial laboratory operations began in May 1982. To date, however, the CWL has been limited in developing an effective water quality monitoring program by a lack of staff and a shortage of funds for salaries and transport.

Following the mid-term evaluation in 1983, the CWL conducted a series of water quality tests on intake and tap samples from schemes in the central and southern regions. According to Young and Briscoe (1986), the results showed that taps had an average faecal coliform (FC) count of 15 colonies/100 ml and intakes had an average of 21 FC/100 ml.

Additional information on project water quality was obtained by Young and Briscoe (1986) during the course of a health impact study in the Zomba East scheme during January through May 1985. From 100 samples taken from taps, they found geometric means of 12 faecal coliforms/100 ml and 280 faecal streptococci/100 ml. In contrast, samples from nearby unprotected wells and a river had means of 540 FC/100 ml and 3900 FS/100 ml.

The most extensive program of water quality testing to date occurred during 1985-86 when the CWL collected and tested samples from six USAID-financed schemes over both wet and dry seasons. The six schemes were Liwonde, Zumulu, Kasinje, Nanyangu, Champhira North, and Mwansambo/Kasakula. During the July through September 1985 dry season, 322 water samples were taken from intakes and taps and tested for faecal coliforms (FC) and faecal streptococci (FS). Testing showed all samples to contain faecal indicator bacteria. In general, samples contained up to 30 FC/100 ml and up to 50 FS/100 ml. Only the Zumulu subproject intake had significantly higher FC and FS counts. The CWL report on the dry season samples concluded that the water in all six schemes was of acceptable quality and that total elimination of faecal contamination could be achieved only through chlorination, which was not recommended for the rural schemes because of the cost of the requisite chemicals (Lewis, 1985).

The results of water quality testing by the CWL during the January through April 1986 wet season were incomplete at the time of the final evaluation, and results were available only for Liwonde, Zumulu, Kasinge, Nanyangu, and Champhira North. Preliminary data showed wet season FC and FS counts to be more than double those found in the dry season. In the case of the Liwonde and Zumulu schemes, FC and FS counts exceeded 100 organisms/100 ml.

The evaluation team finds the foregoing results on water quality testing to be consistent with a rural water project supplying untreated water drawn from protected water sources. Some faecal contamination is normally found in such systems, but as the data from the Zomba East study by Young and Briscoe show, water from unprotected sources is at least an order of magnitude more contaminated than water from protected project sources. This represents a major improvement in water quality and, under the circumstances found in rural Malawi, may be the most that can be afforded by project communities at the present time. In most cases, the coliform counts are not hazardous to health, even though they do not achieve the recommended (and usually unrealistic) standards developed for urban piped systems.[1] This is not to imply that the existing faecal coliform counts are unimportant: the RWS should monitor schemes which show especially high counts and develop corresponding actions to reduce them. The need to monitor problematic schemes points out the general need for an overall program of water quality monitoring. Until such a program is established, there always will be uncertainty regarding project water quality.

Overall, the evaluation team also believes that the $99,000 spent by USAID on the CWL was a good investment in institutional strengthening of the rural water sector. Nevertheless, there should be greater involvement of the CWL in the design stage of water projects. Furthermore, a need exists to develop relevant water quality standards for rural schemes.

### 6.2.3 System Reliability

System reliability can be defined as the capability of a water system to provide uninterrupted service throughout the year. In any water system, service interruptions can occur for a variety of reasons: inadequate source, demands greater than the capacity of the reticulation system, pipe breakages, clogged pipes and fittings, and poor design of tanks and pipelines. The monitoring assistants (described in Section 5.3.1) follow a yearly inspection cycle in the rural piped water program in which pipelines, taps, tanks, and intakes are inspected for leaks, breakages, and inadequate flow rates. Reports are sent on a monthly basis to a monitoring supervisor who reviews the progress of the work and compiles a six-month report for headquarters. Minor repairs are attended to by the self-help village repair team with the assistance of the monitoring assistant. More difficult repairs are referred to the supervisor for correction by the RWS.

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[1] The Senior Water Chemist in the CWL has suggested the establishment of national drinking water standards for untreated supplies which would allow up to 50 FC/100 ml before recommending routine disinfection.

The two studies of system reliability have been conducted by the RWS. The first was a field study of five schemes in the Mulanje area -- Namitambo, Muloza, Sombani, Chilinga, and Phalombe -- carried out over the period March 1982 to March 1983. All of these schemes were completed before the start of the USAID-financed program. The study was based upon observations on the availability of water at the final tap on selected pipelines in the foregoing schemes. In the Namitambo scheme, observations of six taps at the end of AC pipelines showed that water was available between 85 percent and 92 percent of the time. Measurements in the other schemes were made only at a single final tap. One scheme, with an AC pipeline, was in service 76 percent of the time, while the other three schemes, all with PVC pipelines, had reliability ratings between 96 percent and 99 percent. Overall, water service at the observed taps was restored within five days in 80 percent of the interruptions. The longest interruption was 26 days.

The second study consisted of an analysis of monthly pipe breakage inspection reports for 1983 and 1984 for schemes at Zombo and Kawinga and in the Central Region (Easton, 1985d). An interruption in service was taken to be the time between a report and the subsequent repair of a breakdown in flow at a tap. For 1983, three schemes were analyzed; for 1984, the total was expanded to six. No USAID-financed schemes were included in the 1983 list, and only two, Zumulu and Liwonde, were part of the 1984 study group. All taps in the selected schemes were included in the analysis. Table 16 below shows the reliability of each scheme over the study period.

Table 16
**Reliability of Water Systems**

| Subproject | Number of Taps | Number of Tap Days Without Water | Percent of Time Taps Produced Water |
|---|---|---|---|
| 1983: | | | |
| Chagwa | 95 | 181 | 98.9%(Jan/June) |
| Mchinji | 116 | 223 | 99.4 |
| Zomba East | 702* | 25,199 | 80.3(Jan/June) |
| Zomba East | 790 | 14,758 | 89.7(July/Dec) |
| 1984: | | | |
| Kawinga | 338 | 695 | 99.4 |
| Zumulu | 163 | 628 | 97.8(July/Nov) |
| Liwonde | 144 | 402 | 99.2 |
| Chagwa | 95 | 48 | 99.8 |
| Mchinji | 116 | 389 | 99.5 |
| Lingamasa | 48 | 502 | 97.1 |
| Ntonda | 195 | 1,049 | 98.4 |
| Lifani | 140 | 2,254 | 91.2(July/Nov) |
| Zomba East | 790 | 1,089 | 99.2(Jan/June) |
| Zomba East | 468* | 4,186 | 95.1(July/Dec) |

*Parts of Pirimiti Station not included.
Source: Adapted from Easton, 1985d.

For 1983, the foregoing data show a reliability rating of 80 percent or better. This figure would have been higher but for the fact that the Thondwe River in the Zomba East scheme washed out a river crossing in 1983 which affected 134 taps for more than seven months. In 1984, the corresponding data for a larger number of schemes gives a reliability rating of 91 percent or better. The monitoring inspection reports showed that most breakages are repaired in two days or less. For the period July to December 1984, for example, 91 percent of all breakages were repaired within two days and only 5 percent required more than three days. The data in the overall study did not distinguish between systems using AC pipe and those using PVC.

The RWS analysis for 1983-84 also probed the reasons for pipe breakages. Of the 987 breakages reported during the study period, 34 percent were due to the quality of pipe (poor manufacture, excessive exposure of PVC pipe to the sun, and mishandling), 23 percent were due to the quality of field conditions (accidentally out in the field, excessive pressure, vandals, and shifting soils), 29 percent were caused by the quality of pipe laying (bad joint, broken collar, too much solvent cement), and the remainder (14 percent) were for reasons which were not categorized. From these data, it is evident that the majority of pipe breakages can be traced to poor construction practices -- the categories represented by the quality of pipe and the quality of pipe laying.

The evaluation team believes that, with few expections, the piped systems designed by the RWS and constructed with the help of local villagers have proved themselves to be highly reliable. Water systems using communal taps often have maintenance problems, and it is not uncommon to find in other areas of Africa, both rural and urban, numerous examples of broken pipelines, plugged taps, and otherwise inoperative systems because of a lack of maintenance services. In Malawi, the two studies by the RWS show reliability ratings of 76 percent or better in the Mulanje area and 80 percent or better in a variety of other areas. The most common causes of pipe breakages are being addressed, and the more recent data show considerable improvement in system reliability, which often attains service levels of 89 percent or better. These reliability rates, along with the fact that most interruptions of service are corrected within two days, are clear evidence of the generally excellent work being performed by the self-help repair teams. Even further improvements may be possible. The evaluation team recommends that project supervisors pay greater attention to ensuring that proper construction practices are followed in order to minimize the problems endemic in self-help schemes.

### 6.2.4 System Accessibility

System accessibility is the walking distance between the house and the nearest water tap. The design criteria of the RWS allow a maximum one-way distance of 500 meters, although most houses are reported to be within 200 meters of taps. Site visits to several subprojects generally confirmed this spacing and indicated that water mains and reticulation networks are sited to serve population concentrations.

Actual data on walking distances to taps are limited to studies conducted on the Zomba East and Champhira North schemes. The results also show the influence of the proximity of traditional water sources on the use of water

taps. The Zomba East subproject, for example, is located in an area of numerous water holes and streams which, being close to houses, offer alternatives to the taps provided by the piped scheme. In 1981, the Centre for Social Research found only marginal differences between walking time to taps and walking time to traditional water sources in the Zomba East scheme (Msukwa and Kandoole, 1981). A 1985 health impact study of the Zomba East subproject, conducted during the rainy season when traditional water sources were plentiful, found that 315 households took drinking water from taps located an average of 218 meters away, but another 481 households collected water from traditional sources (borehole, unprotected well, and river) at an average distance of 181 meters (Young and Briscoe, 1986).

On the other hand, usage of water taps seems to be greater in traditionally dry areas. An RWS survey of 336 households in the Champhira North scheme in 1985 found that tap users walked an average walking distance of 202 meters to the tap as compared with an average distance of 410 meters to their former source of drinking water (Easton, 1985b). The few nontap users generally lived more than 1,000 meters from the nearest tap. They took their drinking water from traditional sources located approximately 400 meters away. Thus, a comparison of the Zomba East and Champhira North schemes shows that tap users live an average of 200 to 300 meters from the taps but that there are some households which do not use tap water because of either distance to the tap or the ready availability of traditional water sources.

On the basis of the field visits and limited statistical data, the evaluation team concludes that the overall project has improved accessibility to safe water but that people will often continue to use traditional sources if they are significantly closer than the nearest taps. The implication of this for the project is that closer tap spacing must be used in water-surplus areas if all people are to rely on tap water for their drinking and cooking needs.

### 6.2.5 System Sanitation

Components of system sanitation in the USAID-funded project include aprons, washing slabs, dish racks, and latrines.

**Aprons:**

During implementation of a piped water scheme, a concrete apron is constructed for each tap. The tap committees have responsibility for keeping the apron clean, for collecting money for cement from the users, and for repairing and even rebuilding the aprons when necessary. Although no accurate data exist, it is evident that many of the aprons are not in good repair and that maintenance of the aprons in a sanitary condition is not generally a high community priority. The threat of disconnection of taps having unsatisfactory aprons has never been carried out.

If, as seems appropriate, it is considered important to maintain the aprons in reasonable condition, then an alternative approach to apron maintenance should be considered. This may necessitate the provision of the necessary cement when the apron is considered beyond repair. At present, the only possible source of funds necessary for such repairs is government.

**Washing slabs:**

As discussed in Section 5.2.2, more than 100 washing slabs have been constructed under the HESP program. As with many other activities in the rural piped water program the initial idea has evolved, through a series of field trials and design modifications, into a successful technology. From a limited formal assessment conducted by the Water Department (Easton, 1985a), from informal information gathered during interviews (Msukwa, personal communication), and from field inspections by the WASH team, it appears that washing slabs are well used and are maintained in hygienic conditions.

At present, washing slabs are constructed by villagers and HESP staff on a "demonstration" basis. In no case, however, has the demonstration effect been manifested. Moreover, despite a high degree of demand for slabs (Msukwa, personal communication), in no instance have the villagers raised the MK 40 necessary to purchase the cement required for construction of a slab. Both RWS and HESP staff have suggested that consideration be given to including the construction of washing slabs as an integral part of construction of a water system and that the washing slab be constructed at the same time as the tap apron. This appears to be a sound suggestion which should be incorporated into the design of future projects.

Because washing slabs are all relatively new, the issue of how to raise funds to repair or replace them has not yet arisen. Experience with maintenance of tap aprons and the fact that communities have been unable to raise funds for the construction of washing slabs suggests that tap committees may not be able to raise the necessary funds for fixing the slabs. Again, attention needs to be given to the source of funds for meeting this long-term maintenance cost.

**Dish racks:**

One of the tasks of the HESP component has been to promote better food hygiene. A measurable element on which HESP has focused has been the construction of dishracks. In 1984, HESP reported that 44 percent of households in HESP areas had dishracks. These data have not been independently validated, and no comparable data exist either in non-HESP areas or before the HESP intervention. It is impossible, therefore, to determine the success of this activity.

**Latrines:**

As part of the 1984 Joint Review of Primary Health Care activities in Malawi (GOM, WHO, UNICEF, 1984), data were collected on sanitation conditions in rural Malawi. It was found that 55 percent of homes had a latrine, with 67 percent "giving a general impression of being clean and neat."

In addition, household level data froma HESP area in the Champira North subproject were collected by the RWS, which found that 68 percent of the population had latrines before the rainy season, but that, due to collapse of latrines, only 51 percent had them by the end of the rainy season. Eighty-four percent of the latrines existing at the end of the rainy season (the time of the survey) were deemed to be "in good condition" (Young and Joseph, 1986).

Data on latrine prevalence are collected routinely (see Section 5.6.2) by HSAs and forwarded through the district health inspectors to the Principal Health Coordinator. These data indicate that, in the 13 areas of HESP concentration, only 35 percent of families had latrines prior to the initiation of HESP activities, but 64 percent had them after HESP was introduced. To validate the foregoing HESP data, the prevalence of latrines in Champira North as reported in an independent household survey (Young and Briscoe, 1986) can be compared with the prevalence reported by the HESP system for Champira North and South. At the end of the 1985 wet season, the household survey showed that 51 percent of the families had latrines. In comparison, the 1985 HESP data indicated a latrine prevalence in Champira North and South of 48 percent, which leads to the conclusion that HESP data for latrine ownership are credible.

On the basis of these limited data, it can be tentatively concluded that: (a) HESP activities have been focused on areas in which the percentage of families with latrines before the USAID project was substantially lower than the national average; and (b) as a result of HESP activities the percentage of latrines in HESP areas has increased significantly. On the basis of these inadequate data, it appears that HESP has had a considerable impact on latrine construction in the target areas.

# Chapter 7

# PROJECT UTILIZATION

## 7.1 Household Water Use

### 7.1.1 Sources and Uses of Household Water

Project data on the sources used for household water are available for an area in which traditional sources are readily available (Zomba East) and for an area in which traditional sources are not readily available (Champira North).

In Zomba East, where more than 90 percent of families living in subproject areas used the taps for drinking and cooking purposes, only a small number of families drew their water for bathing and clothes washing from these piped sources (Msukwa and Kandoole, 1981). In most cases, families preferred to use the traditional sources (dambos, streams, and rivers) for these purposes.

In the drier area of Champira North, however, the picture is quite different. Prior to the piped water project, villagers drew their drinking water from unprotected wells (70 percent), boreholes (20 percent), rivers (9 percent) and protected wells (1 percent). The women washed their clothes at the river (39 percent), at unprotected wells (20 percent), at home (39 percent) and elsewhere (2 percent). Since construction of the USAID-funded scheme, almost all families use piped water for drinking and more than 94 percent of households use tap water for clothes washing, bathing, cooking, and washing food and utensils (Young and Joseph, 1986).

An important objective in providing improved water supplies to rural populations is to have villagers switch from using traditional, contaminated water sources to the improved source. From the Zomba East and Champira North data, it is evident that the degree to which this substitution takes place depends heavily on the relative distance from the household to the old and new sources. Where the new source is no closer than the old source, the old source will continue to be used for a variety of purposes. Where the distance to the new source is half the distance to the old source (as in Champira North), the old sources largely will be abandoned.

One obvious consequence of this is that consideration should be given to tailoring the maximum design distance to the tap (400 meters at present) to take account of the availability of contaminated traditional sources. As a rough guide, it would appear (from limited available data) that if the distance to the improved source can be reduced to between one-half to three-quarters of the distance to the traditional source, then the traditional sources for the most part will be abandoned. This sugggests that the design rule for "distance to the tap" should be modified as follows:

| | | |
|---|---|---|
| Average design distance to tap | = | 0.5 to 0.7 times average distance to traditional source |

Evidently, more studies of the sort carried out in Zomba East and Champira North need to be carried out before a firm rule of thumb can be derived.

### 7.1.2 Water Consumption

Data on the quantities of water used for domestic purposes have been collected in Zomba South (Msukwa and Kandole, 1981), Zomba East (Msukwa and Kandole, 1981), Zomba West (Linskog and Linskog, 1985), and Champira North (Easton, 1985b and Young and Joseph, 1986).

Several findings which emerge from these studies. First, the average consumption of water (not taking account of use at the tap) is low, ranging from approximately 10 lcd in areas of Zomba West (Linskog and Linskog, 1984) to approximately 20 lcd in Champira North. Second, the quantities of water used for domestic purposes increase only slightly as distance to the water source decreases. In Champira North, for instance, a decrease in distance to the source of approximately 200 meters was associated with an increase in consumption of approximately 5 percent (Young and Briscoe, 1986).

Because many diseases are related to the quantities of water used for personal hygiene, one goal of the USAID-funded project is to encourage the use of more water for personal hygiene purposes. The low figures for average water consumption sound in the various studies on project schemes are a cause for concern. Nevertheless, the goal of increasing water use for personal hygiene must be approached with caution. Because of both custom and regulations regarding the use of tap water, an attitude of water conservation has become a characteristic of the Malawi program. This attitude has allowed large numbers of people to be served with relatively limited supplies of water. Now, however, it is evident that the use of increased quantities of water for personal hygiene must be encouraged. Some possibilities include the construction of more washing slabs, reduced walking distances to the taps, and through hygiene education.

## 7.2 Household Sanitation Practices

### 7.2.1 Water-related Uses

Resent field studies have been carried out on the effect of water storage practices on the bacteriological quality of water in the home. Results for Zomba West and Zomba East are presented in Table 17, which follows.

In both areas, it is evident that bacteriological quality of water, as measured by the fecal coliform count, is higher at taps than at either boreholes or unprotected wells and rivers. The effects of water storage practices, however, are less conclusive. Dry season data for Zomba West indicate that storing water outside the house in uncovered containers used for collection had lower fecal coliform counts than water stored inside the house (Lindskog, 1985). On the other hand, west season data for Zomba East showed no strong relationship between water quality and water storage practices regarding where the jar was stored, whether stored water was scooped or poured, or whether the same or a different jar was used (Young, 1986).

Thus, the source from which water is drawn is a determinant of the bacteriological quality of water in rural areas. Although field data on the effects of water use practices are somewhat ambiguous, hygiene education on sanitary methods of water abstraction, transport, and storage should be included in project implementation.

Table 17

**Bacteriological Water Quality at the Source and in the Household**

| | Fecal Coliforms per 100 ml | | | | |
|---|---|---|---|---|---|
| | Zomba East (Wet Season) Geometric Mean | | | Zomba West (Dry Season) Median | |
| Sample Location | Piped Water | Boreholes | Unprotected Wells and Rivers | Piped Water | Nonpiped Water |
| Source | 12 | 46 | 540 | 57 | 230 |
| Household | 16 | 240 | 760 | 270 | 450 |

Sources: Zomba East (after Young, 1986)
Zomba West (after Lindskog, 1986).

7.2.2 Latrine Usage

Information on actual latrine use by age and sex is notoriously difficult to obtain, and no attempt has been made to collect such data in this project. The evaluation team did attempt to construct a picture of the effect of HESP activities on latrine usage (see section 5.2.2) from the national household survey data of the Joint Review of Primary Health Care Activities (GOM, WHO, UNICEF, 1984), reports from HESP HSAs, and household survey information collected in the HESP area of Champira North (Young and Joseph, 1986). These results, summarized in Table 18, tentatively suggest (using different sample populations) that HESP activities have resulted in an increase in the number of latrines and an improvement in the quality of latrines:

Table 18

**Latrine Usage and Condition**

| | Percent of Families with a Latrine | Percent of Latrines in "Good Condition" |
|---|---|---|
| HESP areas: Pre-HESP | 35% * | not available |
| Post-HESP | 64 * | 84% ** |
| National average | 55 # | 67 # |

* Data reported by HSAs from HESP areas.
** From sample survey in Champira North Project (a HESP area) (Young and Joseph, 1986).
\# From national sample survey for Joint Review (GOM, WHO, and UNICEF, 1984).

## 7.3 Community Support Practices

### 7.3.1 Enforcement of Water Use and Sanitation Practices

Rules surrounding water use practices are centered on the conservation of water, the cleanliness and repair of the tap and apron, the cleanliness and drainage of the surrounding area, the maintenance of the soakaway pit, and the avoidance of undesirable activities at the tap, such as clothes washing, bathing, washing pots and pans, washing food, and any other practice that may lead to soilage or damage of the apron. Most important is the rule against house connections, which has been strictly enforced by tap committees, project committees, MOWS personnel, and the district commissioners for many years.

The mid-term evaluation concluded that the water use rules were being enforced by tap committees, with the backing of the project committees and village headmen, when necessary, and that communities in general accepted and observed the rules. The rules, however, may have been imposed by the project staff, rather than arrived at by consensus.

During the present evaluation, a number of newly constructed washing slabs were observed, but there did not appear to be any prescribed set of guidelines for their care and use. In general, observations of villages and conversations with tap and village health comittees indicate that overall rules for water and sanitation practices continue to be observed and enforced by the villagers. It is unclear, however, the extent to which rules have been imposed by project staff rather than arrived at by village concensus. As described earlier, individual house connections are not allowed, but there has been increasing pressure in recent years for exceptions to the rule.

### 7.3.2 Community Input During Construction

Self-help labor provided by the potential users during construction includes a wide variety of activities. The digging and backfilling of pipelines is the major self-help activity, but others include the digging of foundations for tanks and tap aprons, the loading and unloading of sand, stone and materials, the carrying of water, materials and equipment to project sites, the breaking of stones for aggregate, and the assisting of MOWS water operators in pipeline construction. Local commodities provided by the community include sand, some stone, and digging tools.

The mid-term evaluation found that there was worldwide recognition of the self-help construction work carried out by Malawian communities, that selfhelp contributions were well established prior to the USAID-financed project and that there had been no major changes in local contributions of self-help labor and commodities since the USAID project began.

The evaluation team finds that the general level of community inputs during construction are as planned in the Project Paper. The long tradition of community support during construction has continued and has grown stronger over time. Communities throughout the country are eager to have piped water and are ready to contribute labor and materials to achieve it.

### 7.3.3 Community Input for Maintenance

A description of what communities do and how they are structured to maintain completed piped water systems was given in sections 5.3 and 5.5. In 1983, mid-term evaluation reported that older non-USAID schemes were still functioning and breakdowns were quickly repaired by the communities with a minimum of supervision. It noted the widespread success of the community-supported maintenance system and attributed it to the fact that the communities had acquired a true sense of ownership of the system as a result of their labor and involvement during construction.

The team for the final evaluation finds that system reliability continues to be high (Section 6.2.3) and the time required for repair teams to correct pipe breakages is generally less than two days. Piped water systems throughout the country are functioning, and the maintenance system is probably one of the better rural water maintenance systems in the world. Villages have demonstrated the ability to collect cash to pay for faucet replacements, tap apron repairs, and the salaries for the intake caretakers. The remainder of these contributions is in volunteer labor for time spent on the routine maintenance duties of tap committees, repair teams, and main water committees. In addition, self-help labor is contributed for major maintenance activities, including washouts at river crossings, main line pipe replacements, and intake damages. Until the rural cash economy rises significantly above the present MK 27 per capita per year, the likelihood of communities contributing more cash and less self-help labor is unrealistic.

The skills required by the community to perform the various tasks of routine maintenance are unsophisticated and are easily acquired through short training courses. The costs of the overall matinenance of the piped schemes are equitably shared between the government and the village committees (see Section 5.3.3). In general, the MOWS monitoring staff in the field have the skills and resources necessary to teach and strengthen the village committees. As with every aspect of this program which has been evolving over many years, however, there is some need for improvement and reassessment. The report on "Institution Building for the Maintenance of Rural Piped Water Schemes" (Msukwa, 1986) concludes that there is a need to strengthen local institutions and the training of monitoring field staff.

In summary, the project is working well and the systems are functioning as they were designed. The village maintenance system is a key factor in this success. The time is appropriate to examine strengths and weaknesses of this maintenance system and to make any changes which seem necessary. It is recommended that MOW review and assess the Msukwa report on maintenance and develop a strategy for addressing its findings.

Photo 14. Election of Village Health Committee.

Photo 15. Newly-elected Village Health Committee.

# Chapter 8

## PROJECT IMPACTS

## 8.1 Health Impacts

Community-based rural water supply and sanitation projects are expected to affect health in several ways. Direct impacts might include: reductions in waterborne diseases (such as cholera and typhoid) where the quality of water used for drinking and cooking is improved; reductions in water-washed diseases (such as shigellosis and trachoma), where personal hygiene practices are increased; reduction in water-based diseases (such as schistosomiasis) where direct contact with contaminated surface water is reduced; reductions in a range of fecal-oral diseases (including diarrheal diseases and many parasitic infections), where excreta disposal practices are improved.

The epidemiologic data available for assessing some of these effects in the Malawi Self-help Rural Water Supply Project are unusually rich. In Section 8.1.1, the results of two epidemiologic studies of the effect of the improvement in water quality on diarrheal diseases in the Southern Region are presented. In Section 8.1.2 the results of a study of trachoma in the Lower Shire Valley are described.

In addition to these direct effects, it has been hypothesised that a community-based water supply and sanitation project of this type will have important effects on diseases which are not directly related to water supply and sanitation. This argument has three components. First, recognizing that women in rural Malawi have great demands on their time, it is argued that by reducing the time required for fetching water, a woman is more likely to undertake other time-consuming primary health care activities (such as participation in immunization programs). Second, it is argued that, because of the improved community organization resulting from the successful self-help effort, the community might be better equipped to take advantage of health services (such as immunization opportunities). And third, it is expected that the specific health and hygiene education activities undertaken in some project areas will affect participation in other health care activities. In Section 8.1.3, data from the most recent round of data on the national Expanded Program on Immunization (EPI) are used to assess these effects.

### 8.1.1 Diarrheal Disease

#### a. The Quasi-experimental Study in Zomba West

Over the past several years, an epidemiologic study of several subprojects has been conducted in the Zomba West area by a team of researchers from Linkoping University (Linskog and Linskog, 1985). Data were collected on a large number of social, environmental and health variables during the year prior to the project (January 1983 to March 1984) and a year after the installation of the piped water scheme (September 1984 to September 1985). Because of the size and complexity of the study, only preliminary findings of the epidemiologic study

are available to date. The available results, which focus on the impact of the piped water project on diarrheal disease, are summarized in Table 19 below:

Table 19

**Effect of Piped Water on the Prevalence of Diarrhea in Children under Five in Zomba West**

| | Prevalence of Diarrhea | |
|---|---|---|
| | Wet Season (January to April 1985) | Full Period (September 1984 to April 1985) |
| Areas with Piped Water | 4.5% | 4.0% |
| Areas without Piped Water | 4.1% | 4.0% |

Source: (after Linskog and Linskog, 1985).

From these data, the authors concluded that there was no apparent reduction in diarrhea during the first year after the installation of piped water.

b. The Case-Control Study in Zomba East

With funding from the Self-help Rural Water Supply Project, the University of North Carolina, in conjunction with the MOH and the MOWS, conducted a case-control study of the effect of improved water supply and sanitation on severe diarrheal diseases. The study was carried out in early 1985 for children under five years of age in the Zomba East area. The study design, methods and results have been presented in detail elsewhere (Young and Briscoe, 1986; Young, 1986).

As with the Zomba West study reported above, the case-control study showed that use of piped water alone was definitely not associated with a reduction in diarrheal diseases. The results of this investigation are best presented by means of the scenario shown in Figure 11, which depicts a progression from the "worst situation" of an unprotected water supply and no latrine, through the "first step" of a single improvement in either water supply or excreta disposal, to a "best situation" in which both an improved water supply and a latrine are used.

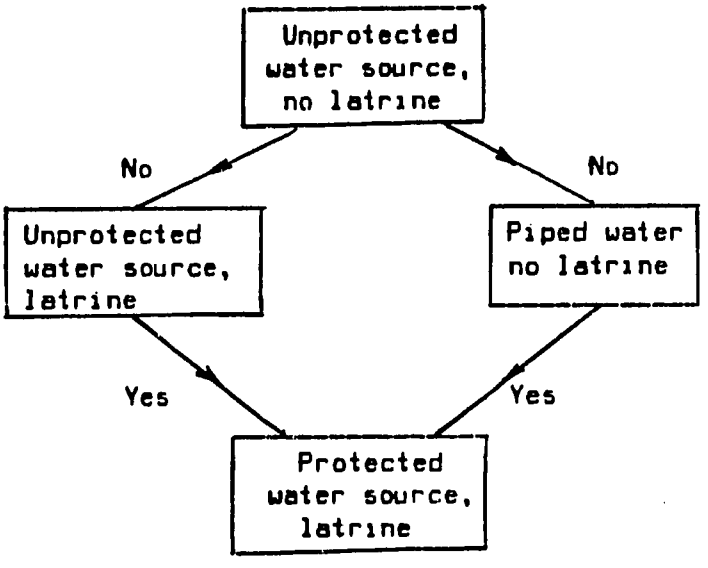


Figure 11. Are Interventions Associated with a Reduction in Diarrheal Disease?

From the analysis of the data (Young and Briscoe, 1986), two main conclusions emerge:

1. The reduction in the risk of diarrhea as a result of the "first improvement" alone (either water supply or a latrine) is much less than the reduction as a result of the "second improvement."

2. As may be expected given (1), the effect of improvements in water supply and excreta disposal are greatest when the other major source of transmission of fecal-oral pathogens (contaminated food) has been reduced (through full or partial breastfeeding).

The case-control study in Zomba East clearly demonstrates the wisdom of focusing hygiene education on breastfeeding activities in areas in which improvements in water supply have been effected, as shown in Table 20.

It should be noted that both these studies of diarrheal diseases were conducted in areas in which water supplies (of poor bacteriological quality) were readily available prior to construction of a piped system. In both cases, it has been documented (Msukwa and Kandole, 1981, for Zomba East; Linskog and Linskog, 1985, for Zomba West) that the distance traveled for water and the quantity of water used for domestic purposes changed little as a result of the piped water project. The studies, then, were evaluating only the effect on diarrheal disease of improvements in the quality of water supplied. In other areas the distance traveled to collect water has been substantially reduced as

Table 20

**Reduction in Diarrhea Due to Breastfeeding in Areas Having Both Latrines and Improved Water Supply**

| Unsupplemented Breastfeeding | Supplemented Breastfeeding | No Breastfeeding |
|---|---|---|
| 79% | 39% | 46% |

Source: (after Young, 1986).

a result of the project. The detailed study in Champira North (Young and Joseph, 1986) for instance, showed that the distance to the water source was halved as a result of the project. In such settings it appears that one effect of the project is to somewhat increase the quantity of water used for domestic purposes.

The findings of the two diarrheal studies cited above have obvious relevance for policy in the rural water sector in Malaŵi. The studies demonstrate that a coordinated program for improving water supply, excreta disposal and food hygiene has the greatest potential for measurable success in reducing the incidence of diarrhea in rural Malaŵi. The decision by the Government of Malaŵi and USAID to couple water supply programs with excreta disposal and hygiene education programs is clearly a wise choice and should be continued.

### 8.1.2 Other Water-related Diseases

**Trachoma:**

In the Mwanza subproject, it is expected that increased availability and use of water will result in substantial reductions in trachoma, a major form of blindness in the area. Not only have epidemiologic studies throughout the world shown trachoma to be responsive to improvements in the availability of water (McJunkin, 1983), but the Lower Shire Valley Ocular Disease Survey of 1983 (Ministry of Health, 1984) found that the prevalence of inflammatory trachoma in children under six years of age in areas within the Mwanza subproject was high (approximately 40 percent in Chapanarga, Massea, and Katunga Traditional Areas of Chilwawa District). Another study of the Mwanza area showed that the prevalence of inflammatory trachoma was strongly related to the availability of water (Table 21) and the frequency of face-washing (Figure 12). Moreover, the prevelance of trachoma increased by 40 percent when face-washing decreased from more than twice a day to less than once a day (Keyvan-Larijani, 1986).

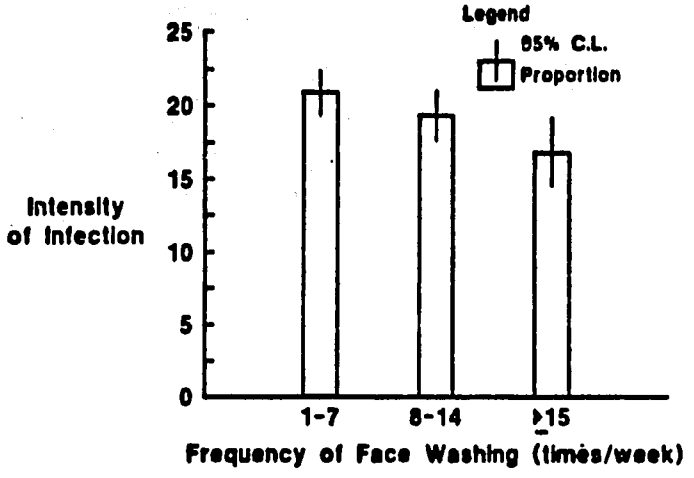


**Figure 12. Severity of Inflammatory Trachoma among Children under Age Six by Frequency of Face-Washing per Week Lower Shire Valley, 1983**

(after Keyvan-Larijani et.al., 1986)

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Table 21

**Prevalence of Moderate to Severe Inflammatory Trachoma in Children Less than Six Years of Age by Distance to the Shire River, Lower Shire Valley Malawi, 1983**

n = 5436[1]

| Location of Village | Total N | Number Affected | Prevalence | 95% C.L. |
|---|---|---|---|---|
| East of River | River | 1,498 | 247 16.5% | (14.6, 18.4) |
| West of River: | | | | |
| -less than 1 km | 1,003 | 178 | 17.7% | (15.4, 20.1) |
| -2 to 4 km | 476 | 107 | 22,5% (2) | (18.7, 26.2) |
| -more than 5 km | 2,447 | 719 | 29.4% | (27.6, 31.2) |
| Total | 5,424 | 1,251 | 23.1% | (21.9, 24.2) |

(1) Twelve subjects are missing ocular exam results for inflammatory trachoma.

(2) Test for trend among those on west side of river $Z = 7.28$, $p < .01$.

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Source: (after Keyvan-Larijani, et al., 1986)

**Schistosomiasis:**

Studies from throughout the developing world have shown that preventing contact with contaminated surface waters is an essential part of a schistosomiasis control program (McJunkin, 1983). The Champira North study (Young and Joseph, 1986) shows that, where the taps in a piped system are substantially closer than the traditional (contaminated) sources to the household, most water-related activities are shifted away from the contaminated surface sources. Because schistosomiasis is a serious health problem in many parts of Malawi, this reduced water contact should be viewed as a positive contribution of the Rural Piped Water Project to health. In the absence of epidemiological data on water contact and schistosomiasis in Malawi, however, the magnitude of such an effect cannot be estimated.

### 8.1.3 Impact on Other Diseases

In Section 8.1, it was hypothesized that the project might affect health not only by reducing the incidence of water- and sanitation-related diseases but also by affecting the utilization of other primary health care services. To measure this effect, it is necessary to choose a measure which is unaffected by the direct impacts of the project, but which also is of public health importance, and on which there exists a reliable, disaggregated data base. The measure chosen for this purpose is participation in the national expanded program on immunization (EPI), which is an activity supported by UNICEF, WHO and the USAID-funded Combatting Childhood Communicable Diseases (CCCD) Program.

In August 1985, a national EPI coverage survey was conducted (Shafa, 1985). Thirty enumeration areas in each of the three regions of the country were selected in accordance with standard EPI sampling methodology. In each selected enumeration area, evaluation teams determined the immunization status of seven children aged 12 to 23 months.

In the first analysis, immunization rates in areas served by the rural piped water program were compared with the rates found in areas not served by a piped scheme. The outcome variable used was the number of children (out of a total of seven in each cluster) who were fully immunized. In a second analysis, three "exposure" categories were defined, namely "with both a piped project and active HESP activities", "with a piped project but no active HESP activities", and "with neither a piped project nor HESP activity." The results of the two analyses are presented in Figures 13 and 14 on the following page.

A WHO analysis of the EPI data for Malawi (Shafa, 1985) shows that a major problem in the Malawi program is a high drop-out rate of participants. The contact rate is high (with 80 percent to 85 percent of children receiving the first dose of polio and DPT vaccines), but the prevalence of full immunization is only 35 percent. It is recognized that a major concern is the lack of effective demand for immunization services.

Figures 13 and 14 provide several important insights into the role of the piped water project and its HESP component in stimulating such demand. From Figure 13, it is apparent that the prevalence of full immunization is more than 50 percent higher in areas served by piped systems than in areas without

such projects. Figure 14 indicates that the improved organizational capacity of the community (resulting from a piped project) is sufficient for stimulating demand for health services. Rather, it is in those areas where the HESP project has focused its activities that the prevalence of full immunization is higher (approximately 100 percent greater than non-HESP areas).

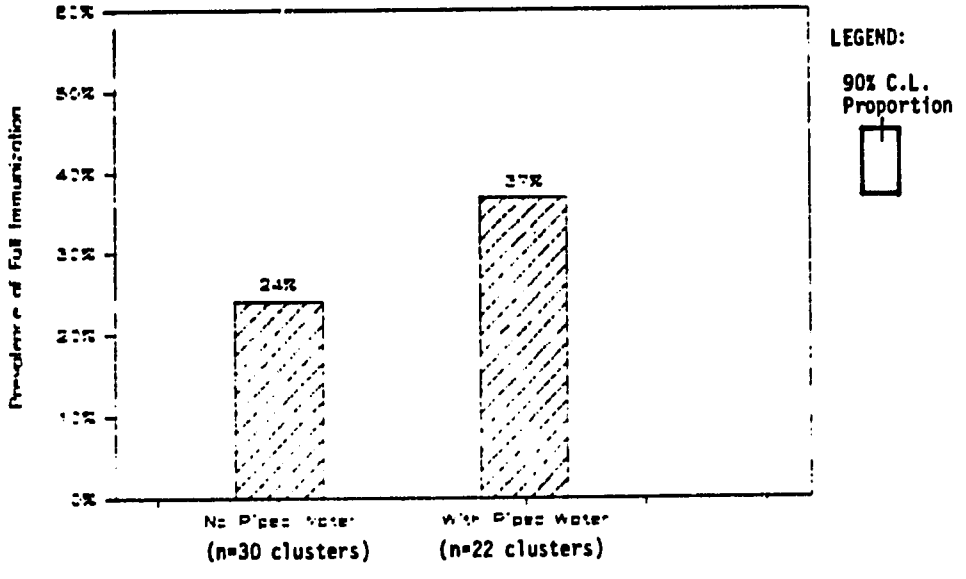


**Figure 13. Effect of Piped Water on Prevalence of Immunization**

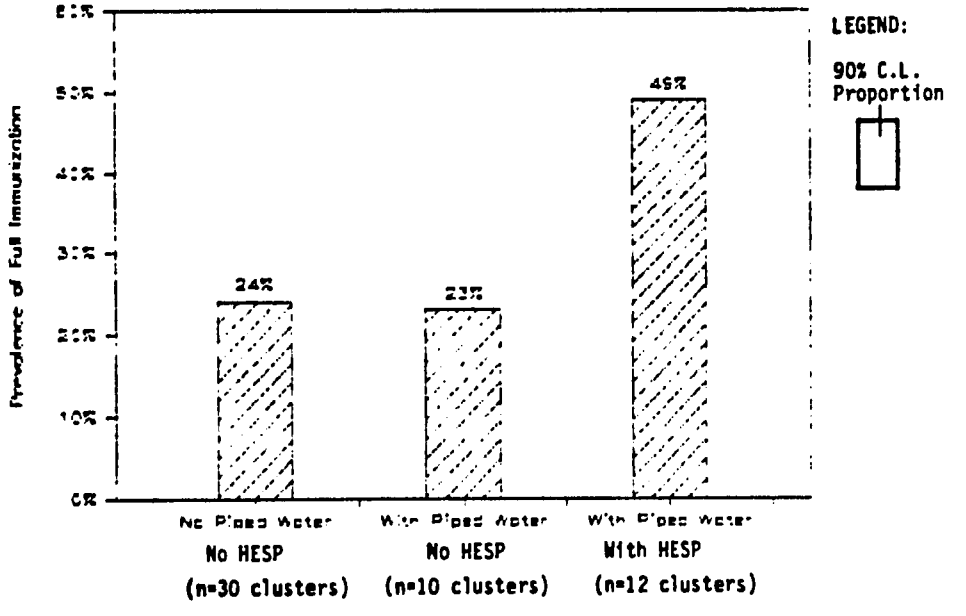


**Figure 14. Effect of Piped Water and HESP on Prevalence of Immunization**

A critical issue is whether HESP activities carried out in the absence of a community-based water program would be equally effective in stimulating demand for immunization services. Only a tentative answer can be given because it is only in areas with improved piped water supplies that HESP activities have been carried out.

Part of the reason for adding the HESP component to the project was that a successful water scheme provided an excellent entry point for the initiation of health education activities. A corollary of this assumption is that similar health education inputs in areas without such prior successful water projects would be less effective.

It may be concluded, therefore, that the joint effect of a piped system and HESP is a large increase in the use of EPI services. Moreover, the EPI effect of each of the inputs (piped water and HESP) separately would be substantially less than the joint effect of the two. In other words, it appears that the effect of each intervention alone is small, but the effects of the interventions together are large.

## 8.2 Economic Impact

### 8.2.1 Time Savings

For women in Malawi, time is precious. Not only do they have household and child-rearing tasks, but also women frequently have major responsibilities for food production. As a result, women -- especially the nearly 30 percent who are heads of households -- face strenuous demands on their time and, in some instances, do not even have time to prepare proper meals for the family (Msukwa, 1984). Because of these demands, programs which increase accessiblity to water and to washing slabs are attractive to women because of the time savings they offer.

The impact of the Self-help Rural Water Supply Project on time spent to fetch water has been investigated in two settings. In Zomba East, where improved supplies were equally distant with traditional supplies, there have been no savings in time spent collecting water. In the drier project area of Champira North, the average distance traveled to the water source was cut by 55 percent (to 190 meters). Under a set of reasonable assumptions* this would translate into a time savings of more than 30 minutes per day for each woman.

### 8.2.2 Increased Agricultural and Industrial Production

The USAID-funded water schemes have almost certainly had a variety of economic impacts on local, regional and even national economic growth. In certain projects, such as Chitipa and Mwanza Valley, a major objective was to facilitate cultivation of fertile areas which were sparsely settled but were

*It is assumed that the average family size is six, that each person uses 20 liters per day, that a woman is the sole carrier of water for the family, that she carries 18 liters per trip, and that she walks an average of three kilometers per hour when carrying water.

lacking adequate water supplies. Measurement of these and other more subtle economic effects, however, remains beyond the scope of this evaluation.

In view of the explicit GOM and USAID policies of encouraging the development of private-sector enterprises, it should be noted that the project has had a positive impact on two private-sector industries. First, the vast majority of materials for the project were procured within Malawi, with the project being the major customer of the PVC pipe extrusion factory in Lilongwe. Second, the construction of civil works, including tanks, intakes, and filters, is contracted out to local contractors, thereby stimulating the development of small, private-sector enterprises in rural areas.

## 8.3 Social and Institutional Impact

### 8.3.1 Experience in Project Planning and Implementation

The first of these social and institutional indicators is experience gained in project planning and implementation. This encompasses the staff and committee members of projects at the national, district, area, and village level. The mid-term evaluation made no attempt to measure or assess this topic other than commenting that observations be continuous and that analysis and interpretation of data be carried out on a cumulative basis at yearly intervals.

In 1985, USAID commissioned the Centre for Social Research to conduct an evaluation of the social and institutional impacts and issues of the rural piped water supply program. Over a period of four months, a total of 18 piped water projects were visited and studied, 7 of them in depth. The CSR study concluded that there was wide variability in the organization and performance of the projects, but that there was a high degree of self-confidence among water project leaders to maintain the system themselves. The level of confidence that the community organizations had in themselves was impressive. Another conclusion of the study was that although water committees might not be actively involved in other projects as committees, the leadership and organizational skills gained over several years of working on the projects were a great asset to the community.

In addition to increasing the confidence and leadership skills of committee members, the all-Malawian senior staff of the Water Department have undoubtedly broadened their skills and abilities to plan, implement, and manage water projects. The increase in confidence and growth in leadership skills of the senior staff in the three years since the mid-term evaluation was clearly apparent. Moreover, field-level staff of the RWS also demonstrate the skills needed to effectively implement projects with a degree of confidence that is difficult to equal.

In conclusion, the participatory experiences of the project and village committees in planning and implementing piped water projects have led to the strengthening of local organizations. The RWS and the Water Department have been strengthened by the five plus years of experience of most of the senior and field level staff of the Water Department in successfully planning and managing water projects.

### 8.3.2 Effect of Cooperative Activities

One assumption of the project is that the participatory experiences of villagers in planning, constructing, and maintaining piped water systems leads to the formation and strengthening of other local organizations in the area and in other parts of the country. The implication is that the community development approach used by the staff of one government ministry may be replicated in other ministries in other sectors. The mid-term evaluation did not directly address this topic but suggested that the spread effects of community participation should be considered as intermediate indicators when considering social and institutional impacts.

It should be noted that the USAID-supported project which began in 1980 made no attempt to alter an already existing and successful model of community development that had been developed and refined over 12 years since its inception in 1968. One of the USAID contributions was the introduction of health education into the piped water projects, which thereby encouraged interministerial coordination between the water and health ministries. It is also noteworthy that the community approach of the rural piped water projects began and was developed in the Ministry of Community Development and Social Welfare. It was not until 1979 that the Water Department was established and the piped water program brought into it.

No hard evidence exists that the community development approach has served as a model in other sectors. There is, however, absolutely no doubt that it has become a demonstrated model for piped water projects throughout Malawi. Village people, on the whole, understand it; they know what is expected of them and they are willing to participate because they want more accessible water. The model for piped water projects has been replicated in all parts of Malawi. In many places where villagers have not worked cooperatively on a self-help project in the past, the piped water program with its participatory approach has been successful.

There are indications that this cooperative approach is having some institutional impact on other branches of the Water Department and the MOH. The borehole program of the groundwater section of the Water Department has encouraged community involvement in project areas. The MOH which has a sizeable field extension staff, has recently joined with the Water Department to hold a joint workshop on training and collaboration approaches.

In summary, the community participation model in the program is widely accepted in villages throughout Malawi, and the approach is beginning to have some impact on other institutions.

### 8.3.3 Increased Involvement of Women

In January 1986, an international conference was held in Malawi to discuss the role of women in water and sanitation development. Delegates from ten eastern and southern African countries and international agencies attended. Representatives from the Malawi MOWS and MOH made presentations strongly endorsing increased involvement of women in the sector.

Women in Malawi are primarily farmers and household managers. According to a national agriculture survey in 1980 and 1981, as many as 28.4 percent of rural households were headed by women, with some districts having as many as 39 percent of households headed by women. As managers of homes, women are responsible for obtaining water for domestic use. In two surveys, in the Zomba area, between 96 percent to 98 percent of water collectors were women. Wherever water is brought nearer to people, it benefits women by decreasing the amount of time they use for drawing water. The involvement of women in the project can be assessed from the standpoints of initial implementation and subsequent maintenance.

Project Design and Construction

Little evidence exists that women have played a significant role in the planning and design stage of piped water projects, other than participating in community meetings to discuss whether the community wants the project. The standard designs for the piped systems use 500 meters as the maximum walking distance from a house to a tap. It is assumed that this is the limit that women have said they would be willing to walk if given a choice between drawing from a water tap as opposed to a traditional source. The fact that women contributed well over 50 percent of the labor during the construction stage of piped water projects has been well documented. Their tasks have included trench digging, transportation of materials (sand, aggregate, water, and pipes), and backfilling.

Project Maintenance

After the completion of the project, women take on fairly distinct roles in the maintenance of the system. Being the traditional managers of water, women are active members of tap committees. (A discussion of the function of the committees is in Section 5.5.1). As shown in Table 22, 69 percent of the tap committee members are women. Their membership in other committees dealing with maintenance, however, is small. No data are available for assessing what the effect of greater female representation in the other committees would have been. Msukwa (1986) states that "probably more women on the repair teams might mean better maintenance."

The Livulezi Integrated Handpump Project has recruited and trained 130 handpump caretakers. Of these caretakers, 120 are women and 10 are men. In a feasibility survey prior to the beginning of this project, 81 percent of the women said they were prepared to be trained either to maintain or to repair the boreholes and shallow wells.

It is also encouraging to see that the MOH has developed a highly successful and entertaining "hygiene education band" made up of rural women who periodically travel with district health staff to perform hygiene improvement songs and dances in project villages. This is a much-needed stimulus for rural women. In addition, the MOH recently conducted a sanitation workshop for women that proved to be successful. Further educational activities directed at women are much needed.

No evidence was available to indicate positive or negative effects of the project concerning the access of women to production inputs and markets, income changes, or division of workloads.

It is concluded that women play a significant role in project construction and maintenance at the tap level, but have a very limited role in project planning, management and maintenance other than at taps. In addition, women could play a much greater role in HESP (hygiene education) activities if given encouragement and training.

It is recommended that the MOWS and water project committees make every effort to expand women's involvement in maintenance activities. The sanitation and hygiene education workshops of the MOH should be expanded to include women.

Table 22

**Committee Membership by Sex**

| Committee | Male | | Female | | Total |
|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number |
| Main Committee | 35 | 92% | 3 | 8% | 38 |
| Section/Branch Committee | 26 | 87% | 4 | 13% | 30 |
| Repair Team | 101 | 98% | 2 | 2% | 103 |
| Tap Committee | 153 | 31% | 341 | 69% | 494 |
| Total | 315 | 47% | 350 | 53% | 665 |

Source: Msukwa, L.A.H. (1986): "The Management of Rural Piped Water Schemes: The Case of Malawi." Paper prepared for ECA Workshop on The Role of Women in Water and Sanitation Development, Malawi.

Photo 16. Village health worker standing next to dish rack.

Photo 17. Health Education "Band" demonstrating use of washing slab.

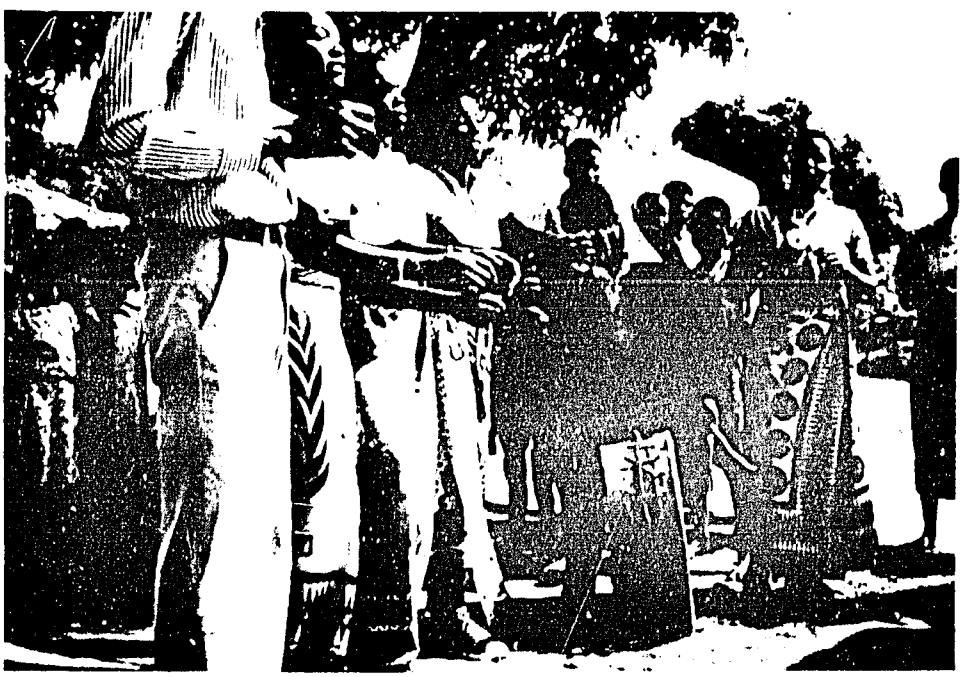

Photo 18 (left). MOH-supported traveling Health Education "Band."

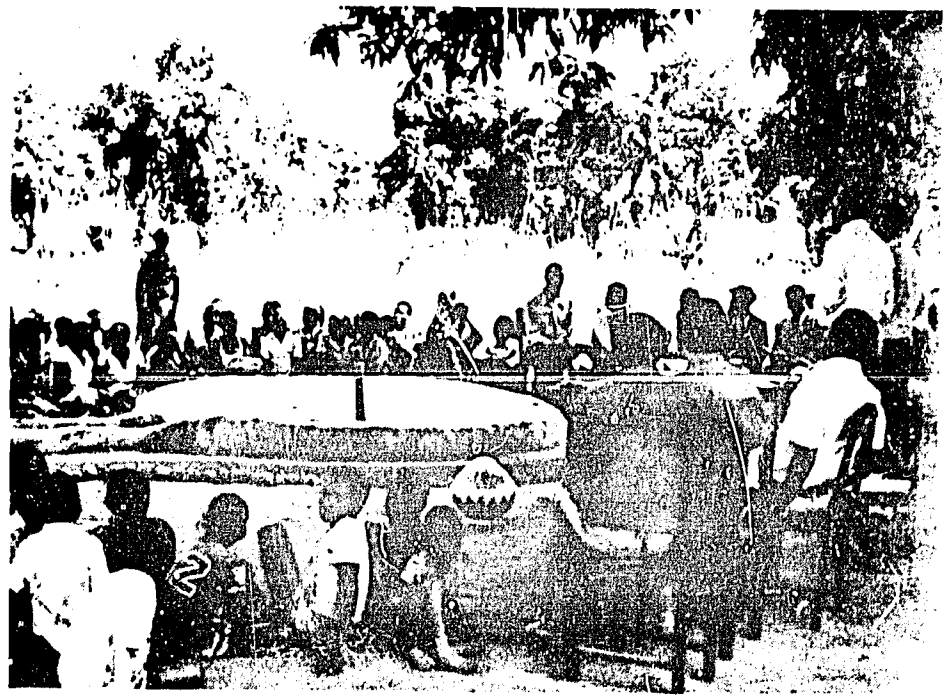

Photo 19 (right). Village gathering at a tap opening ceremony.

Photo 20 (left). The first cup of good water at a tap opening ceremony.

# Chapter 9

## CONCLUSIONS

### 9.1 Overall Project Implementation

The Malawi Self-help Rural Water Supply Project and its associated HESP component are excellent examples of the overall development success that can be achieved through the proper integration of water supply, hygiene education, and sanitation. Starting with a well-established and sound self-help rural piped water program in 1980, USAID financing has supported a major expansion of the piped water construction program as well as the successful addition of hygiene education, sanitation, and research inputs.

As in the mid-term evaluation, the evaluation team finds that the strengths of the project lie in the full involvement of the user communities, field staff within the MOWS and MOH which are sensitive to the needs of a community-based approach to rural water and sanitation development, and dedicated senior staffs within the MOWS and MOH. It is instructive at this point to review the recommendations made to USAID in the mid-term evaluation in view of subsequent project performance. Of the eight key recommendations in the mid-term report, five focused on project design and implementation:

1. "Delete the requirement of the Project Paper and the Grant Agreement for a formal training and research unit within the Rural Water Section of the DLVW."

   As recommended, the requirement was dropped by USAID because the DLVW (the predecessor organization to the MOWS) had neither the personnel nor the facilities to set up a formal unit for training and research.

2. "Prepare a comprehensive research and evaluation plan for the final years of the project."

   A comprehensive plan for all project-related research and evaluation was not prepared by the RWS and the HESP component staffs, as recommended in the mid-term review. A USAID short-term consultant, however (Dr. John Briscoe), visited Malawi in February 1985 and outlined a plan for preparing the information required for the final evaluation. He suggested developing information on project performance, utilization, and impact in both the areas of water supply and sanitation. This plan formed the basis for most of the applied research activities leading up to the final evaluation.

3. "Deemphasize the role of ultimate impacts in the end-of-project evaluation and stress instead the assessment of intermediate-level indicators of system performance, water use behavior, and community support."

   Under normal circumstances, this recommendation would have been followed because of the great difficulty in assessing ultimate

project impacts. USAID and the GOM, however, wisely chose to commission a number of research studies which included detailed investigations of health, economic, and social impacts. The resulting studies have proved extremely useful data on project performance, utilization, and impact.

4. "Strengthen the HESP component in the MOH in order to bring more health education and sanitation elements into the project."

   This recommendation was accepted but only partially supported. Additional funds beyond those proposed in the Project Paper have been made available to the MOH, and a training-of-trainers workshop was offered for HESP and RWS staff. Nevertheless, more could have been done, as detailed in this final evaluation.

5. "Provide continued support to the Malawi Rural Piped Water Program as long as the GOM maintains its commitment to the community-based development approach which has been so successful to date."

   The GOM, over the past three years, has maintained its firm commitment to the community-based approach in the project, and USAID has responded with full, continued support.

The mid-term evaluation also contained three additional recommendations to USAID which were outside the scope of work of the evaluation team but were believed to be important to the continued success of the project:

1. "Reassess project status in early 1984."

   This recommendation was directed at impending personnel and organizational changes in the RWS at the time of the mid-term evaluation. Although no formal reassessment of the project occurred, USAID maintained a close watch over the project during the months immediately following the mid-term review and found that progress toward project objectives was satisfactory.

2. "Prepare a high-level manpower plan for the DLVW."

   This recommendation was intended to assist the impending reorganization mentioned above. As it turned out, the reorganization had relatively minor effects upon the project, and the proposal for a manpower plan was not implemented by USAID.

3. "Sponsor study trips of DLVW officials to neighboring African countries."

   Although a few senior officials have visited related projects in neighboring African countries, this recommendation was not implemented with USAID or project funds.

In general, the recommendations of the mid-term evaluation have been accepted and implemented by USAID. In those cases where recommendations were not fully implemented, no adverse effects occurred in the project.

It is also necessary to compare the progress of the project with the initial objectives set out in the Project Paper. As shown in Section 2.2, the objectives are defined in terms of program goal, project purpose, end-of-project status, and major outputs.

The expected major outputs include:

| Project Paper | Final Evaluation Projections |
|---|---|
| 1. Completion of up to 23 water schemes. | 1. Completion of 19 water schemes. |
| 2. Training of 20 new staff annually and in-service training of 120 technical staff. | 2. In the RWS, 19 new staff added since 1980. No new MOH staff added. All RWS staff (104) and HESP staff (112) receive annual in-service training. |
| 3. Focused sanitation and hygiene activities in each of the 23 locations receiving piped water. | 3. HESP activities occurring in seven USAID schemes and six non-USAID schemes. |
| 4. Establishment of a Training and Research Unit in the DLVW. | 4. Requirement deleted after mid-term evaluation. |

The expected end-of-project status includes:

| Project Paper | Final Evaluation Projections |
|---|---|
| 1. Up to 202,000 people with access to piped water. | 1. Piped water is being provided to 265,000 people to date. Design population (1997) is 422,000. |
| 2. Rural piped water supply program to be expanded, strengthened, and coordinated with the MOH. | 2. Done, as described in Chapters 5, 7, and 8. |
| 3. Up to 202,000 people exposed to health education related to improved sanitation and hygiene practices. | 3. HESP activities have reached 270,000 people to date. |

The third level of objectives is the project purpose, which is "to assist the GOM in its Rural Piped Water Program, which will in turn provide safe water to a significant percentage of Malaŵi's rural population." As indicated in the foregoing outputs and end-of-project status, the project has both strengthened the GOM rural piped water program and exceeded its targets for populations provided with piped water and health education activities.

Finally, the highest objective is the program goal, which is to "improve the basic living conditions and health of Malawi's rural population/poor" by reducing the water-related diseases among rural villagers and by increasing disposable time for rural women and children. Although the health impacts are not yet conclusive, results to date indicate that project activities result in reduced diarrheal morbidity and increased acceptance of vaccinations. Moreover, in water scarce areas, water carrying time savings of up to 30 minutes per day per household were observed in project communities. To these people, there is no question in their minds that the project has improved their basic living conditions.

## 9.2 USAID Special Concerns

### 9.2.1 Sustainability

Because of overall low costs, high community involvement, and well-established procedures for training, monitoring, and maintenance, the project is expected to have a high degree of sustainability once USAID funding has ended. On the technical level, a wide variety of in-service training courses have been institutionalized within both the MOWS and the MOH for all levels of project personnel. As the programs continue to expand, however, there will be increasing need to provide management training at senior staff levels.

Similarly, routine maintenance seems to be assured because monitoring and maintenance procedures have been institutionalized within the MOWS, the MOH, and the local committees. For major repairs, such as washouts, tank failures, and pipeline replacements, the MOWS has established a major maintenance fund in its recurrent budget. The replacement of capital equipment is not considered to be an immediate issue because most project components are anticipated to have long (20 years or more) useful lives. Items which need more frequent replacement, such as taps, drainage aprons, and soakaways, are generally the responsibility of the local users, who have shown themselves to be both willing and able to accept the minor costs involved.

The main uncertainties concerning project sustainability reside in the financial area where several issues should be noted. First, the existence of low salaries in government service, and the perceived limitation of career opportunities in rural engineering, make it difficult to retain mid-to upper-level technical staff. Second, as rural piped water systems become more complex, the consequent increase in maintenance costs will cause the MOWS to review the concept of "free water" and to consider various methods of revenue generation within the piped schemes. And third, there are no assured donors for either the continuation of the capital works program or the payment of salaries to the monitoring field staff in the MOWS.

Overall, there are no major policy changes needed to facilitate continued long-term impact of the project. As indicated above, the primary areas warranting increased attention are management training for senior staff and revenue generation to support future maintenance needs.

### 9.2.2 Women in Development

Much of the success of the Malawi Self-help Rural Water Supply Project can be directly attributed to the involvement and participation of rural women. Women, being the managers of water in the village, have seen and directly benefited from more accessible potable water. The MOH has made a commendable start with HESP activities in the training and education of women in improved hygiene, but much more needs to be done. The MOWS has recognized the role that women can play in the maintenance of handpumps. All indications are that giving similar responsibility to women for maintenance of a piped water project also would be successful. Greater participation and training of women in the piped water project probably would improve the functioning of the project and could lead to significant behavioral changes that will improve the health and quality of life in rural communities of Malawi.

### 9.2.3 Environmental Issues

The Initial Environmental Examination (IEE) in the Project Paper recommended a negative determination. This statement indicated that USAID anticipated no significant adverse environmental impacts to result from the rural piped water project or its HESP component.

Reviewing the project six years later, the evaluation team finds that project activities have had no significant environmental impacts in the areas that are relevant to rural piped water projects: construction, water abstraction, and community facilities. In construction, little heavy equipment is used and, therefore, land-use practices are rarely altered to provide vehicle access. Pipeline intakes are usually located in protected forested catchments that are accessible only by foot. Pipeline construction on steep hills is done in such a way as to minimize erosion and prevent endangerment of the line. In flatter areas, pipe trenches do cross cultivated fields, but the area of activity usually is only slightly over a meter in width, and the filled trenches are regraded annually by the local community and planted with drought-resistant paspalum grass.

In water abstraction, the quantity of water withdrawn from mountain streams by pipeline intakes has not had any noticeable impact on streamflow in either the lower reaches or the surrounding watershed. In a few schemes, the intakes take in the entire streamflow during the dry season (Champhira North), but such surrounding intakes are usually sited far from populated areas. The largest approved USAID scheme (Zomba West), when completed and at full design flow, will abstract only 25 liters per second (22,000 gal/hr), while the bulk of project schemes will average less than 10 liters per second (9,000 gal/hr). In most of the larger schemes, such as Mwanza Valley, multiple intakes are used to take advantage of both wet season and dry season streamflows. In Mwanza Valley, moreover, the streamflow eventually disappears into the ground at some distance below the intake.

Finally, water use impacts in the project communities are, if anything, favorable toward the environment. All taps and washing slabs are designed to have properly constructed soakaways for drainage waters. In most cases, soakaways are ringed with a border of flowers and small decorative plants intended to beautify the soakaway and its drainage channel. Similarly, the

greater availability of water in the communities has encouraged the construction of sturdy, well-built latrines, whose overall effect on village sanitation is usually superior to that of the former methods of excreta disposal. Thus, the recommended negative determination in the IEE of the Project Paper is reconfirmed during this final evaluation.

## 9.3 Specific Conclusions

Numerous specific conclusions regarding the current progress and future performance of the Self-help Rural Water Supply Project and its HESP component can be derived from the findings of this evaluation. The most important of these conclusions are presented below for the main functional areas of the project. Those conclusions pointing out problems or weaknesses in the project should not be viewed as fundamental criticisms of what is probably the most outstanding rural piped water program in Africa but rather as opportunities to further strengthen the project and increase its effectiveness.

Financial:

1. Funding has been adequate for the MOWS activities but could have been greater for MOH activities.

The construction and maintenance components of the project have had a long history, and estimates of resources to accomplish program objectives in those areas have proved to be quite accurate. The HESP activities of the MOH were a much newer program which evolved over the life of the project. The behavioral impacts anticipated for the HESP program have required targeted efforts and have been constrained by limited staffing and commodities, thereby resulting in fewer training sessions for village health committees and fewer washing slabs constructed than if greater resources had been available.

2. The success of the project could not have been achieved without the essential inputs of USAID, the GOM, and local communities.

Both the implementation design and the underlying philosophy of the project rely on the joint efforts and commitment of the foregoing three groups. The needs and purposes of the parties are accomplished best when all resources, skills, talents, and efforts are coordinated. Each has a sense of ownership and strong motivation to ensure the long-term success of the water schemes.

3. Since the mid-term evaluation, project financial management by the MOWS and the MOH has shown marked improvement.

Serious time lags and procedural difficulties, which plagued the process of claiming reimbursement by the ministries, have been greatly reduced. USAID has made reasonable efforts to accommodate the accounting practices of the ministries. Their claims have been processed in a more timely manner for forwarding through Treasury than in the early years of the project. The result has been improved management and a lessening of the costs incurred by the GOM in providing temporary project funding.

Technical:

1. The engineering designs and construction procedures used in the program are well suited to the rural conditions of project sites.

Given the rural nature of project locations, the absence of heavy transport and equipment, reliance upon unskilled self-help labor for most construction activities, and the use of only small amounts of skilled contractor inputs, the design and construction procedures are generally quite appropriate to project needs. These procedures have continually evolved over the past 18 years as project requirements and resource inputs have changed. The most recent modification in design procedures occurred within the last two years in the form of changes in the design of pipelines and storage tanks.

2. Further development is needed in the design of low-cost latrines and water treatment technologies.

Two technical problems require further attention in project areas. The first is the problem of collapsing latrines in areas of high rainfall and poor soils stability. The second is the increasing occurrence of poor water quality of a chemical, physical, or bacteriological nature in certain schemes. Typical problems include high sediment loads, excessive carbonates, and occasional high fecal coliform counts. Applied research is needed on low-cost methods appropriate to individual household resources and systemwide operating costs.

3. Completed schemes show a high degree of reliability in delivering water to rural communities.

Investigations of the USAID-financed Liwonde and Zumulu projects, plus seven additional non-USAID projects, show that these schemes deliver water on the average 90 percent of the time at all taps (or alternatively all the time at 90 percent of the taps), except in the few instances of major pipeline breaks. During 1984, the last year for which data are available, the two USAID projects plus five other schemes delivered water at least 97 percent of the time or better. The worst project for which data are available is Zomba East, which in 1983 had a pipeline washout at a major river crossing which affected 134 taps for 7.5 months. Despite this problem, the Zomba East project as a whole was 80 percent reliable during the period of the major washout.

Management:

1. Both the Self-help Rural Water Supply Project in the MOWS and the HESP component in the MOH have sound management control and technical direction from their senior staffs.

Project activities in both the MOWS and the MOH were directed initially by expatriates but now are under the full control of Malawian nationals. Both ministries are fortunate to have dynamic and dedicated officials fully committed to project objectives and to a community-based development approach. As the program continues to expand, however, there will be a growing need for additional management training for these individuals.

2. Key staff in both the RWS and HESP are overloaded and need additional senior staff support.

In the MOWS there are only two engineers in the RWS responsible for all of the work previously handled by seven or eight engineers. In the MOH, the principal health coordinator is solely responsible for the direction of the entire HESP component. Both ministries need additional professional staff to handle the growing workload on the project.

3. Field-level staff (MAs and HSAs) are generally performing adequately but could be more effective with additional training and logistical support.

HESP and monitoring activities depend on the skills of field operatives of the MOH and MOWS. As these activities expand into new areas, staff need to be introduced to the philosophy, methods and objectives of the program components. The community develoment skills needed to mobilize the village health, tap, and maintenance committees are key to successful performance. The mid-term evaluation identified significant community development strengths in the Rural Water Section of the MOWS. The recommendation of the mid-term assessment for a joint training-of-trainers effort has been recently implemented. The diffusion of the skills obtained by staff at that session is seen as critical to improved performance.

The upgrading of the skills of the MOWS staff involved in construction who are shifted to monitoring responsibilities should be a high priority. Budget constraints may have reduced full implementation of the training of monitoring staff. Equally important are the transport needs of field staff. Some are responsible for large areas and their ability to undertake the consistent support of community activity so necessary for improvement in project effectiveness is often limited by transport. Some need bicycles and some require motorcycles to limit the time devoted to travel and ensure more time is available for community work.

4. A need exists to integrate HESP activities more closely with project construction.

Because of limited resources in the MOH, the HESP component has not been able to keep up with the rural piped water construction activities of the MOWS. There tends to be a lag between water project construction work and the effective introduction of HESP activities. The two ministries need to find ways to coordinate the introduction of their respective activities in order to more effectively achieve the benefits of water, hygiene education and sanitation.

5. An urgent need exists for long-range planning beyond the completion of the USAID project.

Neither the MOWS nor the MOH have made any formal plans for the continued expansion, or, for that matter, the maintenance of the rural piped water program and its HESP component beyond the termination of current USAID support in December 1988. A continuation of the current level of activity would require donor support which is not yet assured. The MOWS and MOH need to begin planning for the post-project period in order to maintain continuity in sector development and to prepare proposals for future donor support.

Maintenance:

1. Community-based pipe repair teams are performing well in maintaining project schemes.

The performance of the community pipe repair teams is measured by the reliability of the system. System reliability has been monitored and evaluated by calculating numbers of pipe breaks, time taken to repair breaks, and the number of repeat breaks. System reliability was rated high, and the repair teams' performance was good.

2. A growing need exists to generate revenues for maintenance purposes.

The operations and maintenance costs of existing rural piped water supplies are estimated to be approximately MK 0.13 per person served annually. Approximately 90 percent of these costs are met by government. The operations and maintenance costs of new rural piped water systems will be higher, and are estimated to be MK 0.36 per person served annually. A need exists to reconsider the assumption that all of these costs will be met from governmental funds and a need to investigate methods (such as permitting private metered yard and house connections) for generating revenue for covering these costs.

3. Community participation in maintenance committees may be made more effective in a number of ways.

The Centre for Social Research report (Msakwa, 1986) makes a number of recommendations on ways to improve the functioning of maintenance committees: committees should serve for a fixed period of time, more workshops should be held for committee members, monitoring assistants should be provided additional training on maintaining the committees, and so forth.

Community Participation:

1. Project-related local committees form the basis for full community involvement in the project.

One of the strengths of the rural piped water program is the number and effectiveness of the committees operating at the village and area levels. A project providing water for 10,000 people may have as many as 50 committees with ten members on each committee during construction and maintenance phases. This committee structure guarantees that the committees are actively involved.

2. A high degree of community participation is the primary element in the continuing success of the project.

Community participation does not stop when the construction of the project is completed. Water projects in Malaŵi, unlike some self-help projects, continue to require community involvement in order to ensure their proper performance. The main water committee, the repair teams, the tap committees, and the caretakers form the overall team which ensures that the system works and is maintained.

Training and Manpower:

1. Women are not receiving sufficient technical training in water and sanitation.

Approximately 120 Malawian women have received training as handpump caretakers in a groundwater project, but only two women have been trained as repair team members for piped water projects. Women recently received training in a workshop on sanitation sponsored by MOH and UNICEF. No such training specifically designed for women has been carried out under the USAID-sponsored HESP program. In general, women are not receiving sufficient technical training in piped water and sanitation.

2. Both the rural piped water program in the MOWS and the HESP component in the MOH need a manpower development plan.

As the number of completed schemes increases and plans are prepared for additional schemes, the manpower needs of the MOWS require systematic review. Essential positions need both identification and plans for recruitment. The training needs of current staff and the availability of appropriately trained future recruits require evaluation and planning for specific programs. Issues to be addressed include both continuing training for skills sharpening and educational requirements for promotion to positions of greater responsibility. HESP activities of the MOH are constrained by manpower shortages at senior health officer level and in the limited number of established positions for health surveillance assistants. An analysis of the manpower needs, options, and actions required to expand HESP activities is needed to complement expanding piped water construction activities.

Monitoring and Evaluation:

1. Field-level monitoring systems in the MOWS operate well.

A reporting system has been developed and is in general use. This facilitates management of project activities and identification of strengths and weaknesses in project operations. This information is used in staff supervision and training. The data gathered appear to be of good quality and is submitted on a timely basis.

2. Field-level monitoring systems in the MOH require more supervisory feedback.

This is of critical importance due to the "staff" function of the HESP Principal Health Coordinator in the "line" structure of the MOH. Data collection must be viewed as an important function. The requirements of accuracy and timeliness are best communicated by direct feedback of problems and relevant findings. This effort will require the commitment of considerable time and effort and thus has manpower implications. An analysis of information and a corresponding feedback of findings have important implications for training and setting of priorities.

3. Neither the MOWS nor the MOH has the current capacity to carry out necessary evaluation studies.

Until 1983, the MOWS had a senior officer conducting evaluation studies on rural piped water systems, and his work was continued by a Peace Corps Volunteer until 1985. The remaining senior staff in the RWS are too busy to undertake the vital evaluation studies on project operation that are needed for effective management control. Similarly, in the MOH the principal health coordinator has too many responsibilities to adequately direct and evaluate investigations relevant to HESP activities.

4. Evaluation studies are essential for the continuing success of the project.

The results and guidance provided by various studies of water quality, water use, pipe breakages, and committee performance, as well as financial audits and the mid-term evaluation, all point out the need to have a variety of evaluative investigations of project performance. Such studies are essential to identify existing problems, to provide continuing management support, and to anticipate future situations. As was stated in the Project Paper and reaffirmed in the mid-term evaluation, a need exists for a comprehensive plan of applied research and evaluation studies for the entire project.

Research:

1. The project has benefited greatly from various outside research investigations carried out by the MOWS, MOH, and outside investigators.

In-house engineering research conducted by the MOWS has provided valuable information which has been incorporated into design and operation procedures. Particularly important are investigations on intake design, the cause of pipe breakages, and the design of water treatment processes. Outside research conducted in conjunction with both ministries has provided invaluable information on water and sanitation-related behavior, institutional functioning of the maintenance systems, and the health impacts of the project.

Project Utilization:

1. In water surplus areas, taps should be sited closer to the users than in water-scarce areas.

An objective of the rural piped water supply program is to have villagers abandon contaminated traditional sources and use exclusively the improved water delivered through the piped systems. Applied research in project areas shows that, under present design practices in water scarce areas, the improved water is sufficiently close to homes to effect such behavioral changes, but that in water rich areas the traditional sources continue to be used for many household purposes. It is concluded, therefore, that in water rich areas the distance to the improved supply needs to be reduced to encourage abandonment of the traditional supplies.

2. The HESP component is bringing about an increase in the number and usage of sanitation facilities in its target areas.

Although data are inadequate to draw definitive conclusions, it appears that the percentage of families with latrines increases substantially once HESP becomes active in an area and that the percentage of families with latrines in HESP areas is now substantially higher than in non-HESP areas. Latrine slabs have been built in several HESP areas and are popular with the village women.

3. Rural communities throughout Malawi know of and desire to participate in the rural piped water program.

Over the past 18 years, the project has become a model of community participation which has directly involved more than 500,000 people. People know that they can get clean tap water near their house if they will work for it. They know what is expected of them and what they can expect from the government. The partnership has become a model for all self-help projects.

Project Impacts:

1. When hygiene education and sanitation activities are undertaken in rural piped water areas, there are substantial direct and indirect health benefits.

Hygiene education and improved sanitation are an essential complement to improved water supplies.

Research investigations carried out in rural piped water subprojects in the Zomba area show that improvements in water supply alone are not associated with a reduction in diarrheal disease among young children. While the use of latrines without improved water supply in one subproject did not lead to a decrease in diarrheal disease, it was shown that, where prior improvements in water supply had taken place, latrine use was associated with a large decrease in diarrheal sickness. In another area, a detailed epidemiological study of trachoma has led to the expectation that by improving the availability of water and the hygienic habits of the people of the Mwanza subproject, there will be substantial declines in the prevalence of trachoma. Finally, an analysis of immunization data suggests that the immunization rates in areas served by both rural piped water and HESP activities are much higher than in areas which do not receive these services.

2. In some areas, the project results in substantial time savings for women.

An investigation in the water-scarce Champhira North subproject showed that women saved approximately 30 minutes per day because of the improved availability of water. In the water-surplus Zomba area, on the other hand, it was shown that improved supplies were no more accessible than traditional supplies and, therefore, there were no time savings as a result of the rural piped water.

3. The project is successfully integrating the piped water program of the MOWS and the HESP component of the MOH.

Over the life of the project, there has been substantial progress in integrating HESP activities into the rural piped water program. This integration has been marked by a close coordination of activities at the headquarters level of the MOWS and MOH, by a joint training-of-trainers workshop, and by the gradual establishment of combined water and health committees at the village level. More needs to be done, however, especially in the areas of cross-over technical training for water and health field staff and the introduction of HESP activities at the start of water project construction.

4. The project is developing leadership and organizational skills within rural populations.

A recent study on the social and institutional impacts and issues of the rural piped water program concluded that the leadership and organizational skills gained by villagers over several years of working on subprojects are a great asset to a community. In addition, committee leaders exhibited a high degree of self confidence for the carrying out of future activities.

5. A need exists to involve women more in project activities.

Women play a significant role in project construction and maintenance at the tap level but have a limited role in project planning, management, pipeline maintenance, and hygiene education. A growing body of information suggests that women can participate fully and effectively in these other activities.

## Chapter 10

## RECOMMENDATIONS REGARDING THE USAID-FINANCED PROJECT

1. Strengthen the HESP component in the MOH by adding another senior health officer and providing more money for field activities.

The results of the HESP component have been outstanding. Evidence exists of improved environmental sanitation practices, of improved participation in other primary health care activities, and improved health for villagers in rural piped water projects who are reached by HESP activities. Continued success of the HESP component is potentially jeopardized by the fact that a single senior health officer is assigned to the project. If these initial successes are to be sustained and replicated, it is essential, first, that the principal health coordinator be supported by another senior health officer assigned full time to the project. Once this strengthening of senior personnel occurs, the HESP component could effectively use additional funds to extend its coverage of the population served by the USAID-funded rural piped water projects and to improve the quality of the program.

2. Incorporate washing slabs into the rural piped water construction program of the MOWS.

Because of various staffing, financial, and logistic constraints, the MOH is unable to introduce HESP activities into all project villages during water system construction. It is recommended, therefore, that the construction of washing slabs on a self-help basis, but under the supervision of the rural water operators of the RWS, be included in the construction schedule of the MOWS. In most cases there should be a washing slab adjacent to each tap. The additional cost to the piped water program of the MOWS would be four sacks of cement per slab (MK 40). It is expected that existing rural water operators will be able to provide the minimal construction supervision required.

3. Carry out a study of the remaining potential for rural piped water projects.

Before any planning can be done for the period following the completion of the USAID project or the preparation of proposals to donors for a follow-on project, the MOWS needs to identify and carry out a preliminary feasibility study of future rural piped water projects. It is roughly estimated that there may be perhaps 19 additional projects with a design (1997) population of around 650,000, costing upwards of MK 7 million. It is recommended that a six-month study involving field reconnaissance, preliminary system layout, and preliminary cost estimates should be undertaken as soon as possible, using funds from the construction account of the current USAID project. Such a study would require approximately eight person-weeks of international technical assistance, 18 weeks of MOWS engineering and support time, and MK 21,000 for direct expenses.

4. Prepare a manpower needs assessment for the piped water program in the MOWS and MOH.

This is required to maintain current effectiveness of both ministries and to prepare plans for a follow-on project. The evaluation team found potential staffing problems in the MOW and current constraints in the MOH. Internal analyses of project needs and potential for growth in the event of project expansion should be undertaken at an early date. The assistance of appropriate GOM personnel and budgetary officials will be necessary. Consultation should be sought with USAID and other possible sources of assistance in meeting project-related training and professional education needs. The basic requirements of the assessment are:

a. Identification of the tasks required for current and future piped water program activities

b. Projection of the types and numbers of staff required to accomplish those tasks

c. Identification of current skills and qualifications of staff

d. Assessment of the adequacy of current staff to satisfy the requirements developed in (b)

e. Assessment of the degree to which the labor market can satisfy gaps revealed in (d)

f. Identification of training and/or education needs of current or potential staff to meet identified unmet ministry needs

g. Investigation of sources for training, personnel to be trained, and resources to support training.

5. The MOWS should review and discuss the Center for Social Research report (Msukwa, 1986) on the maintenance of rural piped water projects.

The report by Dr. Msukwa, entitled "Institution Building for the Maintenance of Rural Piped Water Schemes," is an in-depth evaluation of performance of the maintenance structures in 18 piped water projects. The findings provide an excellent insight into the problems that projects are encountering as they move from the construction phase to the maintenance phase. The conclusions and recommendations offer some excellent suggestions regarding possible improvements in the community maintenance structure and field staff performance. Earlier work from 1980 and 1981 provided the Water Department with ideas and suggestions to improve their operation. This periodic assessment, review and possible modification of the program is one of the characteristics that has made the piped water program successful and, for this reason, the program should be continued.

6. Promote greater involvement of women in project activities.

The benefit and need to involve more women in both piped water and HESP activities is clearly apparent. Both the MOWS and the MOH recently have taken steps toward involving women in projects other than in the piped water program. It is suggested that the MOWS encourage committees to select and train women on pipe repair teams and, wherever possible, encourage the membership of women on main water committees. The MOH should repeat their

recently successful sanitation workshop for women living in piped water project areas. Field staff in both ministries should work more closely with the district council home craft workers (who are all women) to determine how their skills and contacts with village women could be employed.

7. Form a small working group to oversee details of management of remaining project funds.

As project activities come to a close, short-term management of the flow of funds becomes more important. Key operational staff from USAID, MOWS, MOH, and Treasury must have accurate, up-to-date information on approved budgets, needs for reprogramming of funds, deadlines for submission of claims for reimbursement, and other management issues. This approach does not alter the intermediary role of Treasury in the process, but rather "keeps everyone up to date." The group should determine its own meeting schedule and work assignments. It is anticipated that meetings will serve to inform, coordinate, identify, and monitor completion of important tasks, such as construction and work plans, reimbursement claims, and final reports. These efforts should contribute to the timely completion of the project and should reduce expenditures by the GOM which cannot be reimbursed by USAID.

## Chapter 11

## RECOMMENDATIONS REGARDING FUTURE WATER, SANITATION, AND HEALTH PROJECTS

1. USAID should consider funding a follow-on project to the current Self-help Rural Water Supply Project and its HESP component.

USAID financing has helped a preexisting, basically sound, self-help rural piped water program to become even more effective with the addition of hygiene education, sanitation, and research activities. The project has been beneficial to the government and people of Malawi and has reflected credit on USAID for its well-directed development assistance. The potential remains, however, to continue this program and to serve even more people with self-help piped water. A follow-on project would draw upon the accumulated knowledge and good working relationships existing between USAID and GOM. It is recommended, therefore, that USAID give serious consideration to funding such a project at the completion of the current project. The follow-on project should be based on the results of the site identification study and manpower needs assessment recommended in Chapter 10. In addition, it is recommended that the HESP component in the follow-on project be provided with proportionally more funds than at present.

2. HESP activities should be expanded to cover all rural piped water projects.

HESP has proven itself to be an integral companion to piped water supply as a means of raising rural living standards and improving the health of rural populations in Malawi. For this reason, the HESP component of any future follow-on project should have the objective of providing hygiene education and sanitation promotion activities to all rural areas having piped water projects, both USAID-financed projects and non-USAID projects. Such an expansion of the current HESP program would require an increase in both MOH staff and program funds. Because of the proven effectiveness of HESP in the rural piped water program, it is recommended that a future follow-on project provide sufficient resources to the MOH to assist it in bringing HESP activities to all rural piped water project areas.

3. Future donors to the rural piped water program should include an applied research and evaluation component.

The applied research and evaluation component has been a great strength of the current project, serving to strengthen program design, implementation and operation, and providing quantitative information on the impacts of the project. It is strongly recommended that donors financing future rural piped water and HESP programs include such a component. While scope must be left for investigating needs which arise during the course of a project, current high priority needs include investigations into improved methods for low-cost treatment of turbid waters, improved low-cost methods for building structurally sound latrines, investigations into the magnitude of actual recurrent costs on rural piped water projects, and mechanisms (including metered private connections in new schemes) for generating the revenues necessary to cover these costs.

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# APPENDIX A

## Officials Contacted

## Appendix A

## Officials Contacted

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|---|---|
| **USAID** | |
| John Hicks | Mission Director |
| Charles Gurney | Public Health Officer |
| Murl Baker | Project Officer |
| Charles Orare | Accountant |
| Richard Day | Program Officer |
| **USAID/REDSO/Nairobi** | |
| Carlos Crowe | Engineer |
| **Ministry of Works and Supplies** | |
| Charles Clark | Permanent Secretary |
| B. H. Mwakikunga | Water Engineer in Chief |
| S.C. de Souza | Chief Water Supply Officer |
| Newton Chaya | Engineer |
| Wellington Mandowa | Engineer |
| V.P. Joshi | Chief Civil Engineer (Design) |
| C.R. Kellow-Webb | Principal Civil Engineer (Planning) |
| E.Z. Laisi | Principal Hydrologist (Water Resources) |
| (Ms) V.B. Mahuka | Senior Stores Supervisor |
| Mr. Mkhono | Principal Accountant |
| Mr. Ndovie | Assistant Accountant |
| Bjorn Brandenberg | Sanitation Advisor |
| F. Kwaule | Water Coordinator-Public Standpost Project |
| W.R. Namaombe | STA Supervisor - Mwansambo/Mwadzama |
| (Ms) L.H. Mauluka | Hydrogeologist |
| W.J. Lewis | Senior Water Chemist |
| S.K. Dhawan | Chief Technical Advisor, National Water Resources Master Plan, UNDP |
| S. Mainala | Principal Hydrogeologist |
| (Ms) R. Banda | Monitoring Assistant, Kasungu Town |
| D.C. Alimoyo | Monitoring Supervisor, Domboli Project |
| S.D. Rome | Monitoring Assistant, Domboli Project |
| F.C. Ngulube | Senior Water Supervisor, Zomba West Project |
| S. Lazardo | Water Operator, Zomba West Project |
| A.T. Chibwana | Water Supervisor, Nachimango Monitoring Centre |
| J.G. Nkhoma | Water Supervisor, Mulanje Project |
| E.A. Priminta | Monitoring Assistant, Liwonda Monitoring Office |
| **UNICEF** | |
| Cooper Dawson | Programme Officer |
| **U.S. Peace Corps** | |
| Michael Culp | Acting Director |
| Frank Dzurik | Volunteer, MOH/Lilongwe |
| Ray Colliver | Volunteer, MOH/Lilongwe |

UNDP

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|---|---|
| Zaude Gabre-Mahdin | Resident Representative |
| S. Teuno | Programme Officer |
| M.G. Nyirongo | National Programme Officer |

WHO

| | |
|---|---|
| Mr. Tamondony | Statistician |

Ministry of Health

| | |
|---|---|
| Dr. George | Deputy CMO |
| Findley Chindamba | Chief Public Health Inspector |
| Yohane Nyasulu | Health Superintendent |
| Collin Tasaukadala | District Health Inspector, Kasungu |
| G. Chipwaila | District Health Inspector, Mzimba |
| Reggie Hawkins | CCCD Project Coordinator |
| Debra Heltzer-Allen | Health Communications |
| D.W.G. Zgambo | Chief Accountant |
| P.B. Shani | Principal Accountant |
| Mr. Nyirongo | Assistant Accountant |
| G. Ngwira | Senior Health Assistant, Ruwelezi Health Center |
| R. Manderu | Senior Health Inspector, Zomba |
| E.C. Mbangala | Health Assistant, Zomba West Project |
| W. Chiwaya | Health Surveillance Assistant, Zomba West Project |
| B. Miso | HESP Supervisor, Champhira North Project |

Ministry of Finance (Treasury)

| | |
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| Mr. Mkulumba | Claims Officer Accountant |
| M. Makalande | Administrative Officer |
| Mr. Phiri | |

Other

| | |
|---|---|
| Lewis Msukwa | Senior Research Officer, Centre for Social Research, Zomba |
| B.A. Kaunda | MCP District Secretary, Mzimba |
| K.J. N'gwenya | Vice-Chairman, Champhira South Project |
| T.N.C. Ngoma | Vice-Chairman, Champhira North Project |
| J. Kachere | Chairman, Health and Tap Committee, Zomba West Project |
| W.G. Kaduya | Chairman, Water Committee, Muloza Crater Project |

# APPENDIX B

## Scope of Work

1.INPUTS OF FUNDS, COMMODITIES, AND PERSONNEL
1.1.DETERMINE THE QUANTITIES, TIMING, COSTS (BOTH FOREIGN EXCHANGE AND LOCAL CURRENCY), AND GENERAL AVAILABILITY OF THE FOLLOWING AID INPUTS:

1.1.1. CONSTRUCTION PROGRAM (COMMODITIES, VEHICLES AND EQUIPMENT, RWS FIELD STAFF SALARIES, OPERATING COSTS, TOOLS AND MISCELLANEOUS EQUIPMENT).

1.1.2. MAINTENANCE PROGRAM (RWS FIELD AND OTHER STAFF SALARIES, OFFICE EQUIPMENT, PER DIEM FOR TRAINING COURSES, WATER METERS, MOTORCYCLES, OPERATING COSTS, AND LIBRARY AND PUBLICATIONS).

1.1.3. MONITORING, COORDINATION AND EVALUATION (SENIOR EVALUATION SPECIALIST, PUBLIC HEALTH COORDINATOR, DATE GATHERING BY AN OUTSIDE INSTITUTION, VEHICLES, AND OPERATING EXPENSES).

1.2. DETERMINE THE LOCAL CURRENCY COST EQUIVALENTS AND, WHERE APPROPRIATE, THE AVAILABILITY/QUANTITIES AND TIMING OF THE FOLLOWING GOM INPUTS:

1.2.1. SALARIES OF RWS HEADQUARTERS STAFF.

1.2.2. SELF-HELP LABOR IN WATER SYSTEM CONSTRUCTION AND MAINTENANCE.

1.2.3. OTHER CONTRIBUTIONS (RWS OFFICE SPACE AND DLVW WAREHOUSE, OFFICE EQUIPMENT, SUPPLIES, LITERATURE, CASEMENT COSTS, PART-TIME PROFESSIONAL FIELD STAFF, AND LOCALLY FURNISHED COMMODITIES).

2. STRENGTHENING OF INSTITUTIONAL SYSTEMS.

2.1. DESCRIBE THE FOLLOWING PROJECT DEVELOPMENT ACTIVITIES WITHIN THE RURAL WATER SECTION

2.1.1. PLANNING (PROJECT IDENTIFICATION, FEASIBILITY DETERMINATION AND SELECTION).

2.1.2. DESIGN (ENGINEERING DESIGN AND COST ESTIMATING).

2.1.3. PROCUREMENT (COMMODITY PROGRAMMING, ORDERING, AND INVETORY CONTROL).

2.1.4. CONSTRUCTION (FIELD SCHEDULING, FIELD CONSTRUCTION PROJECT COMPLETION, AND SYSTEM TESTING).

2.2. DESCRIBE THE WATER SYSTEMS MAINTENACE PROCEDURES WITHIN THE RWS. INCLUDE BOTH CURRENT PROCEDURES AND PROCEDURES ANTICIPATED FOLLOWING PROJECT COMPLETION.

2.2.1. ROUTINE MAINTENANCE (WATER QUALIT MONITORING, INSPECTION VISITS, MAINTENANCE CAPABILITIES, AND FINANCING OF RECURRENT COSTS).

2.2.2. MAJOR MAINTENANCE (REPORTING, AVAILABILITY OF STAFF, TRANSPORT, AND EQUIPMENT, AND FINANCING OF RECURRENT COSTS).

2.3. DESCRIBE THE TRAINING PROVIDED BY THE FOLLOWING ORGANIZATION:

2.3.1. RWS (RWS TECHNICIANS AND PROFESSIONAL STAFF).

2.3.2. MINISTRY OF HEALTH (DISTRICT HEALTH INSPECTORS, SURVEILLANCE ASSISTANTS, VILLAGE HEALTH COMMITTEES).

2.4. DESCRIBE THE RESEARCH ACTIVITIES OF THE RWS:

2.4.1. SYSTEM STUDIES (LEAST-COST ANALYSIS, TIME SAVINGS, COMMUNITY PREFERENCES, ETC.).

2.5. DESCRIBE THE INFORMATION SYSTEMS PROCEDURES USED IN THE RWS:

2.5.1. DATA COLLECTION.

2.5.2. DATA RECORDING, PROCESSING, STORAGE, AND RETRIEVAL.

2.6. DESCRIBE THE HEALTH AND SANITATION EDUCATION ACTIVITIES WHICH SUPPORT THE RURAL WATER PROGRAM:

2.6.1. ACTIVITIES OF PUBLIC HEALTH COORDINATOR.

2.6.2. ROLE OF VILLAGE HEALTH COMMITTEES AND TAP COMMITTEES.

2.7. DESCRIBE THE PROCEDURES FOR COMMUNITY SUPPORT OF A WATER PROJECT:

2.7.1. RESPONSIBILITIES OF COMMITTEES (MAIN PROJECT COMMITTEE, SECTION COMMITTEE, BRANCH COMMITTEE, AND VILLAGE HEALTH AND TAP COMMITTEES).

2.7.2. INTERRELATIONSHIPS BETWEEN THE RWS AND THE VARIOUS COMMITTEES.

2.8. DESCRIBE THE PROCEDURES FOR INTERMINISTERIAL CORDINATION:

2.8.1. THE ROLE OF THE PUBLIC HEALTH COORDINATOR.

2.8.2. THE COMMUNITY-BASED ORGANIZATIONAL NETWORK.

2.8.3. ACTIVITIES OF AN INTERMINISTRIAL NATIONAL ACTION COMMITTEE FOR THE WATER DECADE.

3. OUTPUTS IN TERMS OF COMMUNITY WATER SYSTEMS.

3.1. DETERMINE THE CONSTRUCTION STATUS OF THE PIPED WATER SYSTEMS PROJECT:

3.1.1. NUMBER OF SYSTEMS BEGUN AND CURRENT STATE OF COMPLETION.

3.1.2. LOCATION AND GEOGRAPHIC DISTRIBUTION OF SYSTEMS.

3.1.3. CONSTRUCTION SCHEDULE SYSTEMS.

3.2. DETERMINE THE OPERATIONAL STATUS OF THE COMPLETED SYSTEMS:

3.2.1. WATER QUANTITY (VOLUMES OF WATER PRODUCED PER TAP/PER MONTH/PER CAPITA).

3.2.3. SYSTEM RELIABILITY (FREQUENCY AND DURATION OF SYSTEM STOPAGES).

3.2.4. SYSTEM ACCESSIBILITY (DISTANCE FROM HOUSEHOLDS TO WATER POINTS).

3.2.5. SYSTEM SANITATION (DRAINAGE AROUND WATER TAPS).

4. PERFORMANCE OF COMMUNITY WATER SYSTEMS

4.1. DETERMINE HOUSEHOLD USES OF WATER SYSTEM:

4.1.1. SOURCES OF HOUSEHOLD WATER (WATER TAP, WELL, RIVER, ETC.).

4.1.2. PROPORTION OF HOUSEHOLDS USING THE WATER SYSTEM.

4.1.3. PER CAPITA DAILY CONSUMPTION OF WATER.

4.1.4. TYPES OF WATER USAGE (COOKING, CLEANING, WASHING, BATHING, HOUSE BUILDING, GARDEN IRRIGATION, BEER BREWING, OTHER SMALL INDUSTRY, PUBLIC INSTITUTIONS).

4.2. DETERMINE SANITATION PRACTICES OF COMMUNITY:

4.2.1. PROPORTION OF HOUSEHOLDS WITH SANITARY LATRINE.

4.2.2. PROPORTION OF HOUSEHOLDS WITH SANITARY WATER STORATE CONTAINER.

4.3. DETERMINE COMMUNITY SUPPORT OF WATER SYSTEMS:

4.3.1. ENFORCEMENT OF WATER USAGE PRACATICES.

4.3.2. PROVISION OF SELF-HELP LABOR AND LOCAL COMMODITIES DURING CONSTRUCTION.

4.3.3. PROVISION OF NECESSARY LABOR TO CARRY OUT MAINTENANCE FUNCTIONS.

5. PROJECT IMPACTS

5.1. DETERMINE THE FOLLOWING HEALTH IMPACTS:

5.1.1. REDUCED MORBIDITY IN WATER RELATED DISEASES (SCHISTOSOMIASIS, ROUNDWORMS, SKIN INFECTIONS ETC.)

5.1.2. GREATER AWARENESS OF HYGIENE PRACTICES.

5.2. DETERMINE THE FOLLOWING ECONOMIC IMPACTS:

5.2.1. WATER CARRYING TIME SAVINGS ON COMPLETED PROJECT

5.2.2. CHANGES IN WATER CONSUMPTION RATES OVER TIME.

5.2.3. ESTABLISHMENT OF NEW PUBLIC SERVICES OR SMALL INDUSTRIES WHICH REQUIRE WATER FOR PROPER OPERATION.

5.3. DETERMINE THE FOLLOWING SOCIAL IMPACTS:

5.3.1. EXPERIENCE IN PROJECT PLANNING AND IMPLEMENTATION.

5.3.2. EFFORTS TO UNDERTAKE OTHER COOPERATIVE ACTIVITIES IN THE COMMUNITY.

5.3.3. INCREASED INVOLVEMENT OF WOMEN IN SELF-HELP ACTIVITIES AND IN POSITIONS OF LOCAL LEADERSHIP.

6. DEVELOPMENT OF LOCAL INSTITUTIONS

6.1. STATUS OF THE VILLAGE COMMITTEES (HEALTH COMMITTEE, SECTION, BRANCH, TAP AND REPAIR WATER COMMITTEES). DO THEY CONTINUE TO FUNCTION AFTER THE WATER SYSTEMS HAVE BEEN INSTALLED AND DO THEY HAVE AUTHORILTY, STATUS AND DEFINED FUNCTIONS?

6.2. RELATIONSHIP OF THE WATER COMMITTEES TO OTHER LOCAL REGIONAL AND NATIONAL INSTITUTIONS: IS AN INDEPENDENT WATER COMMITTEE THE BEST WAY TO INSURE IMPLEMENTATION AND MAINTENACE, OR IS IT DUPLICATIVE OF OTHER INSTITUTIONS? ARE WATER COMMITTTEES SEEN BY VILLAGERS AS THEIR OWN OR AS CREATIONS OF GOVERNMENT? IS THERE A PARTTERN OF FACILITATION DUE TO COMMITTEE MEMBERS HAVING POSITIONS IN OTHER LOCAL INSTITUTIONS?

6.3. CAPABILITY OF LOCAL INSTUTITIONS OT MAINTAIN WATER SERVICES: HAVE THE LOCAL COMMITTEES ACQUIRED THE CAPABILITY TO FINANCE WATER SYSTEMS MAINTENANCE? HAVE THE COMMITTEES ACQUIRED THE NECESSARY TECHNICAL SKILLS TO CARRY OUT ROUTINE MAINTENACE? ARE COSTS EQUITABLY SHARED BETWEEN VILLAGE COMMITTEEES AND GOVERNMENT? DO THE MINISTRY PERSONNEL HAVE THE SKILLS AND RESOURCES NECESSARY TO TEACH AND STRENGTHEN THE VILLAGE COMMITTEES IN ORDER TO INSURE THEIR CONTINUITY?

6.4. REPLICATION FOR OTHER RURAL SERVICES DELIVERY: HAVE THE WATER COMMITTEES SERVED AS A MODEL AND BEEN DUPLICATED FOR OTHER RURAL DEVELOPMENT PROJECTS? WHAT ARE THE MUST COMMONLY RECURRING EXAMPLES?

7. AID SPECIAL CONCERNS.

7.1. SUSTAINABILITY

WHAT LOCAL INSTUTIONAL CAPACITIES (MANAGEMENT, TECHNICAL, FINANCIAL, PROVISIONS FOR MAINTENANCE AND THE REPLACEMENT OF CAPITAL EQUIPMENT) ARE BEING DEVELOPED TO CONTINUE PROJECT BENEFITS? WILL THEY BE IN PLACE ONCE DONOR FINANCING ENDS? WHAT POLICY CONDITIONS ARE REQUIRED TO FACILITATE CONTINUED LONG-TERM IMPACT?

7.2. WOMEN AND DEVELOPMENT

HOW WERRE THE INTERESTS AND ROLE OF WOMEN TAKEN INTO ACCOUNT AT THE DESIGN AND APPRAISAL STAGES? IN WHAT WAY DID WOMEN PARTICIPATE IN THIS PROCESS? HOW DIDI THEIR PARTICIPATION OR NON-PARTICIPATION AFFECT PROJECT ACHIEVEMENTS?

WERE GENDER-SPECIFIC DATA AVAILABLE OR HAVE THEY BEEN DEVELOPED SINCE? HOW HAS SUCH DATA BEEN USED IN GOAL SETTING AND RESOURCE ALLOCATION?

7.3. WHAT ARE THE EFFECTS (IMPAACT IF AVAILABLE), POSITIVE OR NEGATIVE, OF THE PROJECT CONCERNING WOMEN'S ACCESS TO PRODUCTION INPUTS AND MARKETS, DIVISION OF WORKLOADS, INCOME, EDUCATION AND TRAINING, ROLE IN HOUSEHOLD AND COMMUNITY, AND HEALTH CONDITIONS?

7.4. FOR PROJECTS NOT EXPLICITLY ADDRESSED TO ENVIRONMENTAL ISSUES:

WAS THE INITIAL ENVIRONMENTAL EXAMINATION (IEE) NEGATIVE OR POSITIVE?

IF THE IEE WAS NEGATIVE, DID EXPERIENCE SHOW THAT THERE WERE SIGNIFICANT IMPACTS DURING IMPLEMENTATION? HOW WERE OR ARE THESE IMPACTS BEING DEALT WITH?

IF THE IEE WAS POSITIVE, HOW DID THE ENVIRONMENTAL ASSESSMENT (EA) OR ENVIRONMENTAL IMPACT STATEMENT (EIS) CHANGE PROJECT DESIGN AND IMPLEMENTATION? WERE THE ENVIRONMENTAL IMPACTS AS PREDICTED?

B. ORGANISATION

1. THE EVALUATION REPORT WILL BE ORGANIZED IN THE FOLLOWING MANNER:
- 1. ISSUES REQUIRING EVALUATION.

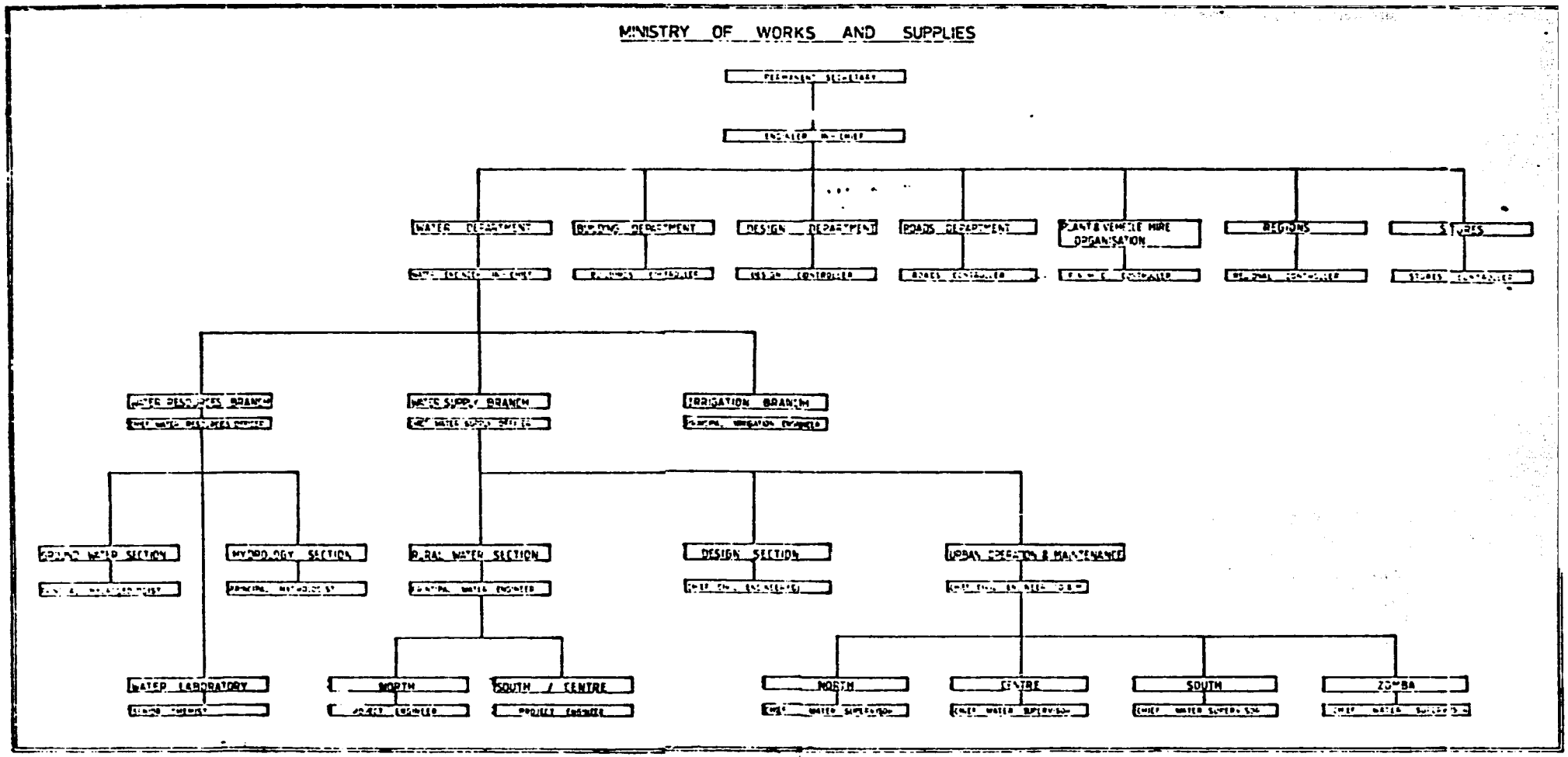
- 2. PROJECT IMPLEMENTATION PROGRESS AND FINANCIAL
- ANALYSIS
- 3. REMEDIAL REQUIRED IN THE PROJECT'S REMANING MONTHS
- IN ORDER TO ACHIEVE OBJECTIVES.

- 4. LESSONS LEARNED AND THE POSSIBLE APPLICATION FOR
- FUTURE WATER PROJECTS IN MALAWI AND OTHER
- COUNTRIES. END QUOTE

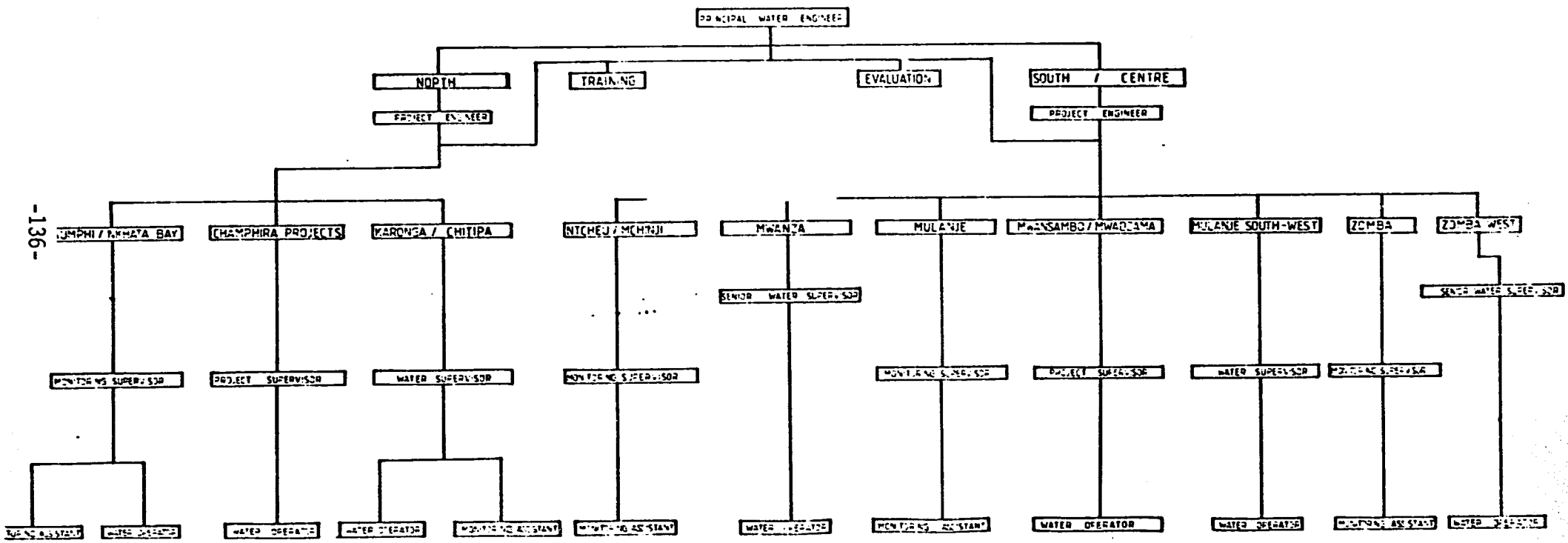
ADAMS##

# APPENDIX C

## Organization Charts of Ministry of Works and Supplies and Rural Water Section


MINISTRY OF WORKS AND SUPPLIES
WATER DEPARTMENT
BUILDING DEPARTMENT
DESIGN DEPARTMENT
ROADS DEPARTMENT
PLANT & VEHICLE HIRE ORGANISATION
REGIONS
STORES
WATER RESOURCES BRANCH
WATER SUPPLY BRANCH
IRRIGATION BRANCH
GROUND WATER SECTION
HYDROLOGY SECTION
RURAL WATER SECTION
DESIGN SECTION
URBAN OPERATION & MAINTENANCE
WATER LABORATORY
NORTH
SOUTH / CENTRE
NORTH
CENTRE
SOUTH
ZOMBA

# RURAL WATER SECTION



# APPENDIX D

## Potential Rural Water Supply Schemes
## and
## Estimates of Person-Weeks to Carry Out
## Feasibility Studies for 19 Rural Water Schemes

## POTENTIAL RURAL WATER SUPPLY SCHEMES (MALAWI)

| Name of Village | Estimated Population (1977) | Projected Population (1997) | Estimated Cost (by comparison with existing Projects). |
|---|---|---|---|
| 1. Mzimba I | 80,000 | 145,000 | Mk 1,500,000.00 |
| 2. Mzimba II | 54,000 | 97,530 | Mk 900,000.00 |
| 3. Usisya | 8,000 | 15,000 | Mk 125,000.00 |
| 4. Ruarwe | 1,000 | 1,800 | Mk 15,000.00 |
| 5. Chikwawa East Bank | 67,726 | 124,000 | Mk 1,010,260.00 |
| 6. Zomba South | 85,000 | 154,000 | Mk 1,364,000.00 |
| 7. Tukombo | 2,000 | 3,600 | Mk 30,000.00 |
| 8. Mlowi | 2,000 | 3,600 | Mk 30,000.00 |
| 9. Mlowe | 2,000 | 3,600 | Mk 30,000.00 |
| 10. Ntchena-chena | 1,000 | 1,800 | Mk 15,000.00 |
| 11. Fuka-piri | 2,000 | 3,600 | Mk 30,000.00 |
| 12. Sankhulani | 10,000 | 18,000 | Mk 150,000.00 |
| 13. Tsavuche | 2,000 | 3,600 | Mk 30,000.00 |
| 14. Dwambazi | 2,000 | 3,600 | Mk 30,000.00 |
| 15. Mbonechera | 8,000 | 15,000 | Mk 120,000.00 |
| 16. Maona | 2,000 | 3,600 | Mk 30,000.00 |
| 17. Linungwe | 6,000 | 11,000 | Mk 60,000.00 |
| 18. Golomoti | 20,000 | 36,000 | Mk 600,000.00 |
| 19. Chitimba | 3,000 | 5,500 | Mk 50,000.00 |
| | 357,726 | 649,830 | Mk 6,728,260.00 |

ESTIMATES OF MAN WEEKS TO CARRY OUT FEASIBILITY STUDY FOR 19 RURAL WATER SCHEMES.

1. Field Work:

| | | | |
|---|---|---|---|
| (i) | Mzimba I and II | ( 2 Projects) | 1 Week |
| (ii) | Rest of Northern Region | ( 9 Projects) | 2 Weeks |
| (iii) | Central Region | ( 3 Projects) | 1 Week |
| (iv) | Southern Region | ( 5 Projects) | 2 Weeks |

2. Office Work:

Total No of Weeks for Office Work = 19

| | | |
|---|---|---|
| (i) | Hydrology Calculations | (19 Projects) |
| (ii) | Population estimates | ( " ) |
| (iii) | Preliminary layout | ( " ) |
| (iv) | Pipeline design | ( " ) |
| (v) | Cost estimates | ( " ) |

3. Additional:

| | | |
|---|---|---|
| (i) | Mobilization of data | ( 19 Projects) 2 Weeks |
| (ii) | Report writing | ( " ) 3 Weeks |
| | Total No. of Weeks | = 30 |

4. Estimated Cost For:

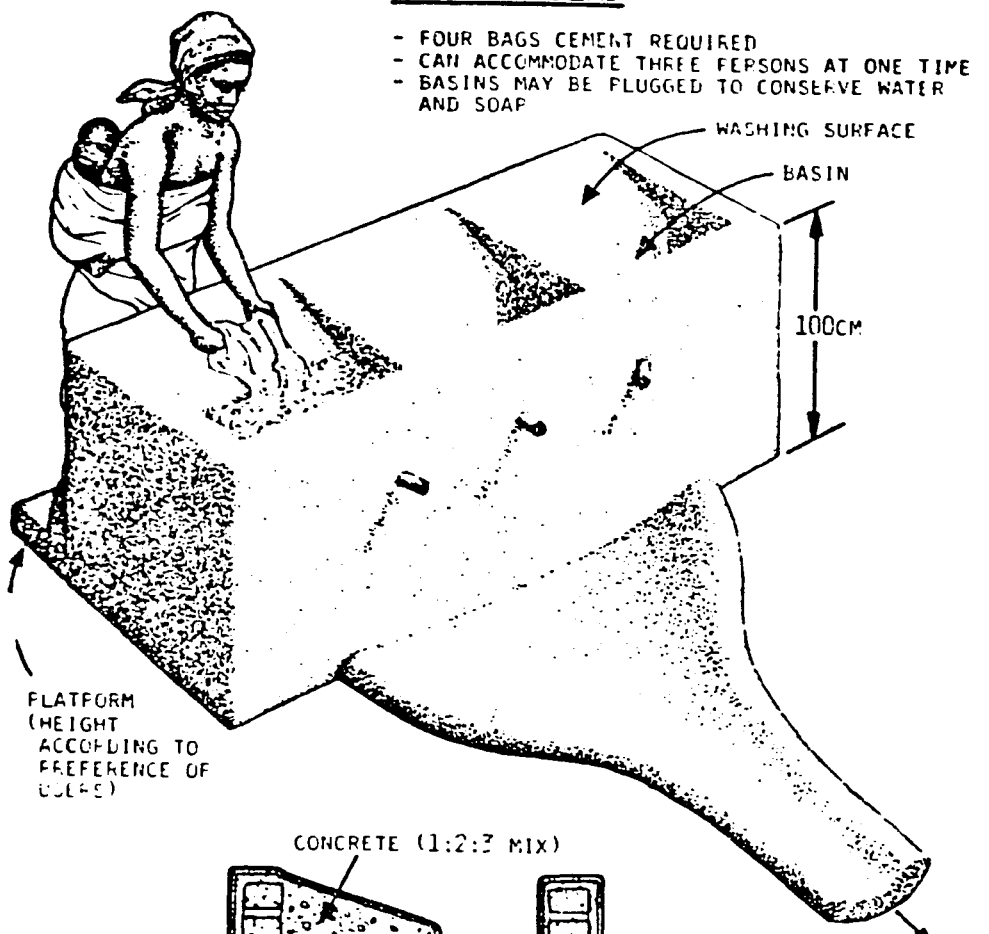
| | |
|---|---|
| (i) Travelling within Malawi 9,000 Km at 50t per Km | =MK4,500.00 |
| (ii) Accommodation at K60.00 per day for 210 days | =MK12,600.00 |
| (iii) Additional expenses for stationery | =MK 1,000.00 |
| (iv) Contingencies (15%) | 2,715.00 |
| Grand Total --------- | MK20,815.00 |

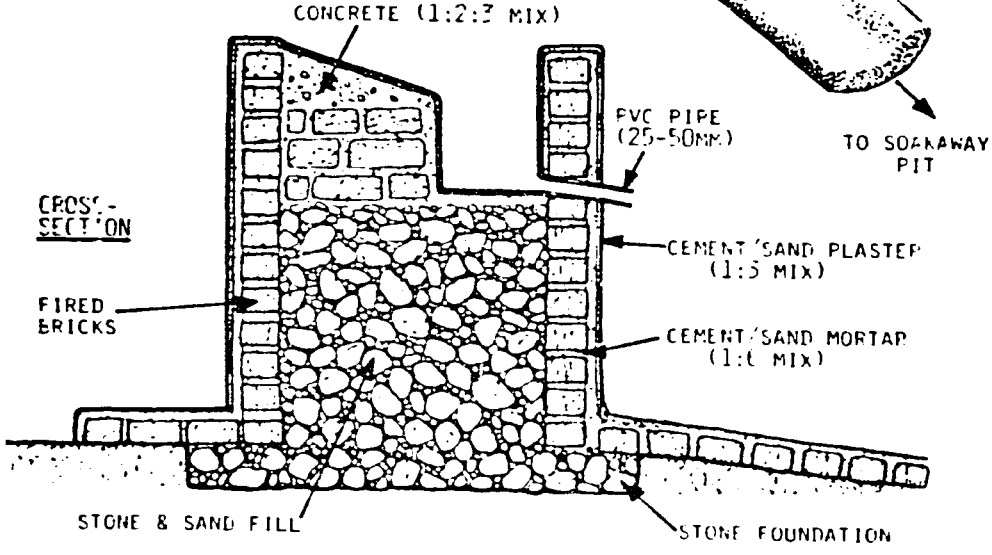
# APPENDIX E

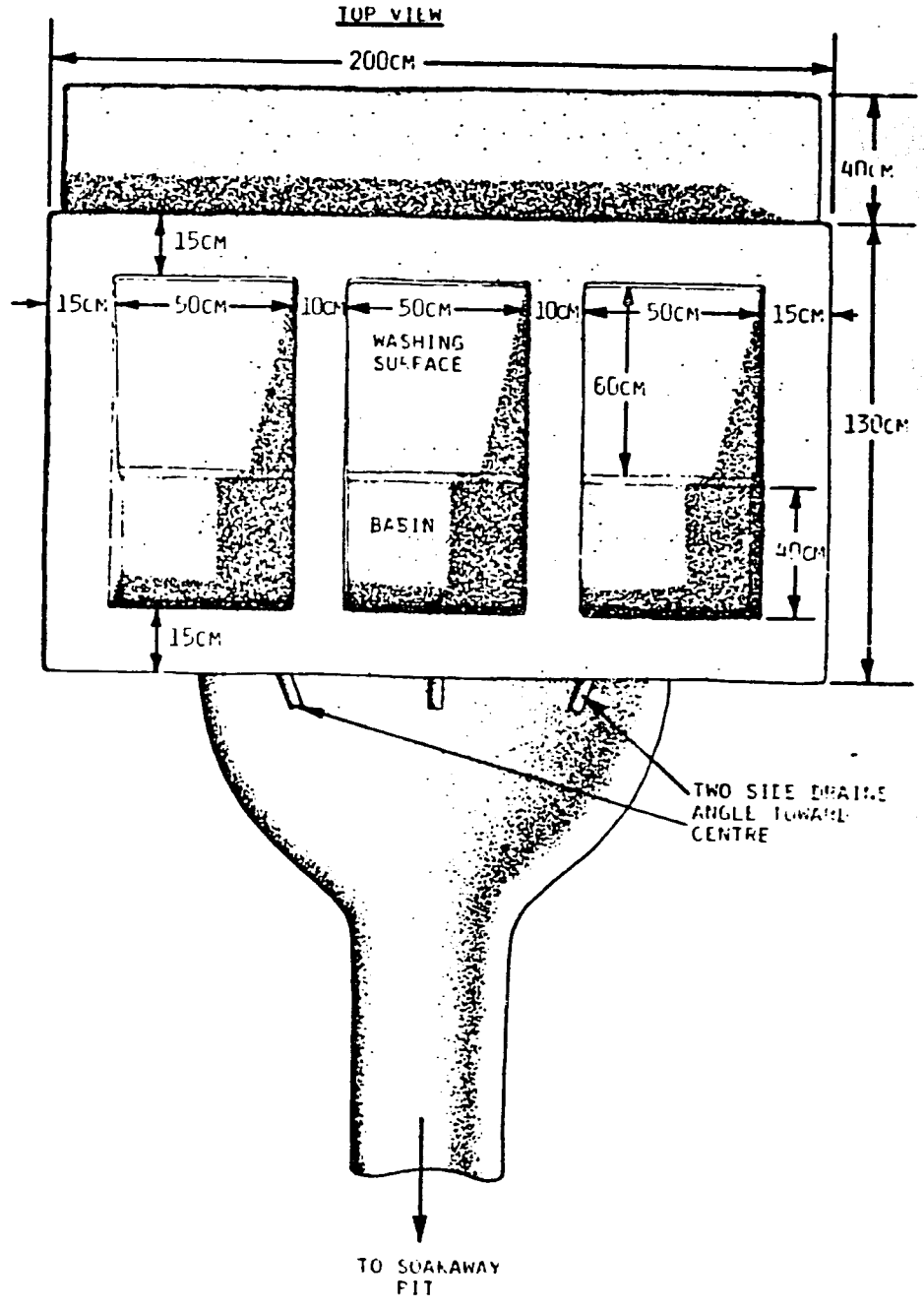
## Design of Washing Slab

# LAUNDRY SLAB

- FOUR BAGS CEMENT REQUIRED
- CAN ACCOMMODATE THREE PERSONS AT ONE TIME
- BASINS MAY BE PLUGGED TO CONSERVE WATER AND SOAP




HEALTH EDUCATION & SANITATION PROMOTION, MINISTRY OF HEALTH, LILONGWE, MALAWI